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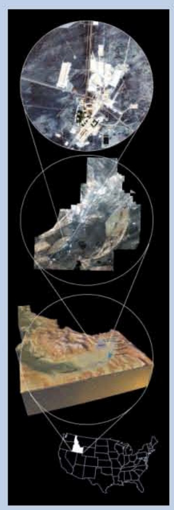

Critical Infrastructure Test Range User's Manual

April 2005

Idaho National Laboratory

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Idaho National Laboratory
Idaho Falls, Idaho 83415

Prepared for the
U.S. Department of Energy
Office of Energy Assurance
Under DOE Idaho Operations Office
Contract DE-AC07-05ID14517

CHANGE HISTORY LOG

Revision	Effective Date	Description of Change
0	September 2004	Initial issue
1	April 2005	Laboratory name change, new contractor, miscellaneous information

CONTENTS

FIGURES

ACRONYMS

AAR	After Action Review
AGL	above ground level
CBR	chemical, biological, radiological
CFA	Central Facilities Area
CITR	Critical Infrastructure Test Range
CITRC	Critical Infrastructure Test Range Complex
CST	Civil Support Team
CTB	Communications Test Bed
DOE	Department of Energy
INL	Idaho National Laboratory (formerly Idaho National Engineering and Environmental Laboratory)
IORC	Information Operations and Research Center
MIPR	Military Interdepartmental Purchase Request
MSDS	Material Safety Data Sheet
MSL	mean sea level
PAO	Public Affairs Office
PBF	Power Burst Facility
PI	principal investigator
R&D	research and development
RCC	Range Control Center
SCADA	Supervisory Control and Data Acquisition
SME	subject matter expert
SRT	special response team
UAV	unmanned aerial vehicle
WCC	Warning Communications Center
WMD	weapons of mass destruction
WTB	wireless test bed
WGS	Waste Generator Services

Critical Infrastructure Test Range User's Manual

1. INTRODUCTION

1.1 Test Range Description

The Idaho National Laboratory (INL; formerly Idaho National Engineering and Environmental Laboratory) is a Department of Energy (DOE) site comprising over 890 square miles and eight major areas (Figure 1).

Figure 1. INL Site with major areas identified.

The INL Critical Infrastructure Test Range (CITR) is an isolated and secure microcosm of the many critical infrastructure systems important to the operation of our country: power, transportation, cyber, and communications. INL was chosen to be a "Test Range" owing to its remote location and dedication to various research, development, and testing activities.

Although National Security (NS) critical infrastructure testing encompasses the entire INL CITR located west of Idaho Falls, an area designated as the Critical Infrastructure Test Range Complex (CITRC) has a number of specific test beds used for research and development:

- Range Support Area, which consists of office structures (Building PER-632), training facility, area power substation, and area water supply system

- Contraband Detection Test Bed (Building PER-613)
- Incident Response Technology and Training Test Bed (Building PER-609)
- Range Control Center (RCC) facility (Building PER-623)
- Office building housing the Range Director's office (Building PER-641)
- Special Programs Building (Building PER-612) Test Bed.

Other test beds are located outside of the designated CITRC area:

- Supervisory Control and Data Acquisition (SCADA) Test Bed (Building IF-608 and Information Operations and Research Center [IORC])
- Power Grid Test Bed
- Wireless Test Bed
- Live Fire Range Test Bed
- Unmanned Ariel Vehicle Test Bed
- Cyber Security Test Bed (Building IF-608 and IORC).

All of the above test beds are dedicated to specific types of critical infrastructure testing needs. The Critical Infrastructure Test Range Complex (CITRC) is the core area of the CITR; it serves as the main command and control area for the overall CITR.

2. CITR POLICIES AND PROCEDURES

2.1 Safety

INL has earned the prestigious status of "DOE Star Site" through its Voluntary Protection Program (VPP). Safety is the number one priority in performing all work at INL. Each INL employee takes an active role in ensuring his or her own safety and the safety of others. All individuals at INL (employees and visitors) are empowered with "Stop Work Authority." If anyone witnesses an unsafe act or feels that his or her safety or the safety of others is being compromised, this person has the authority to stop the work in progress. You accomplish this by contacting your principal investigator (PI). If your PI is unavailable, contact the nearest INL manager or another employee.

All Test Range activities will be reviewed and approved through an INL work control and authorization processes established in INL Safety Procedures.

Prejob discussions will be conducted by the PI with the work group before the onset of testing activities. Risk and complexity of the testing activities will dictate the level and formality of the prejob discussion/briefing. The briefing will address safety concerns, test limitations, site-specific housekeeping, and other test parameters the PI deems necessary.

If range customer activities are covered by the customer's own work control/safety documentation, this *safety data package* must be submitted to the INL PI and must include customer/activity specifications, performance, and procedures for safety-related items.

2.2 Reporting Injuries

In the unlikely and unfortunate event that a CITR client experiences a work-related injury, the client must report the injury immediately to the PI. The PI will follow INL injury reporting procedures and notify line management. Depending on the severity or nature of the injury, the PI may be required to schedule a critique meeting to determine the cause of the accident, corrective actions, and lessons learned.

2.3 Scheduling and Notifications

The Range Director Office is the point of contact for establishing and maintaining the schedule for range activities. This includes publishing schedules, resolving scheduling conflicts, and acquiring required visitor information from external organizations for programs conducted at the CITR.

The thorough but straightforward processes in the appendices depict the steps required to perform testing/training at the individual CITR test beds. Depending on the complexity, risk, and interconnectivity involved in the proposed testing, details of the test plan and approval(s) will vary. The PI will develop the necessary test documentation before conduct of the proposed testing

The PI will be responsible for providing the necessary, qualified technical staff to support the work/testing/training required. The Range Director Office can arrange additional staff necessary for testing at the CITR.

The Range Director may attend routine plan-of-the-week meetings held at the INL Site. This meeting achieves continuous, up-to-date communication between CITR personnel and others conducting work at the Site (Safeguards and Security, Planning and Maintenance, Facility Operations Managers, Construction, etc.). The PI must notify the Range Director of scheduled activities by Tuesday of the previous week in order to have activities reported at the plan-of-the-week meetings. In the case of field-testing/training activities, the PI may be required to contact the Warning Communications Center (WCC) before starting activities to "open a testing window" and also to inform the WCC at the conclusion of the testing to "close the testing window." This is to alert the WCC of field activities, so they can respond positively to any calls from concerned or curious personnel in the area that may not be aware of the scheduled activities. The requirement to notify the WCC will depend on the type of field-testing activities and the nature of the work being performed. The Range Director can provide guidance if needed.

2.4 Environmental Requirements

Environmental requirements and considerations have been identified and approved for CITR user activities on INL Form 451.01, Environmental Checklist.

If tests require environmental considerations not addressed in the approved Environmental Checklist, the document will require an addendum and follow-on review and approval processes. Such considerations should be addressed during the initial planning phase of specific testing activities and resolved before start of testing

2.5 Operational Interface

Figure 2 shows the organizational structure for the CITR. The Range Director is the point of contact and has overall responsibility for coordinating testing and ensuring safety at the Test Range. The Range Director and his support staff (Range Director Office) are responsible for maintaining a current log of all critical infrastructure-related testing being conducted at INL and other INL-funded critical infrastructure testing being conducted at other sites.

Bob White, CITR Director

208-526-0314

cell 520-2739

Robert.White@inl.gov

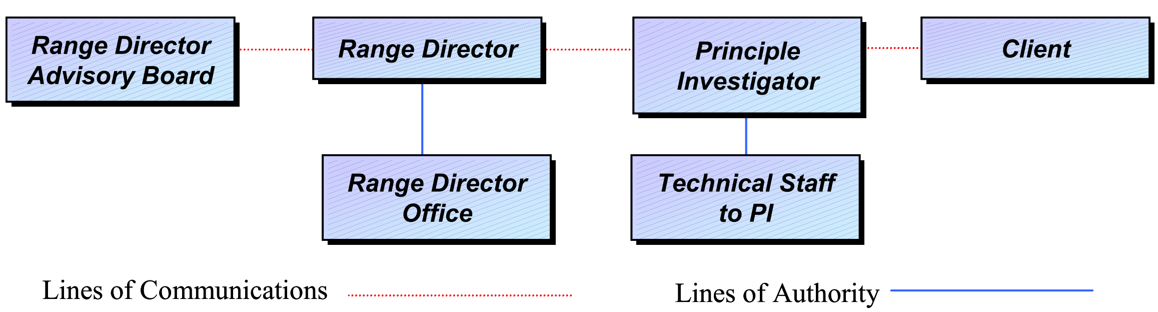


Figure 2. Organizational Structure.

The Range Director Advisory Board will be the management authority for resolving operational issues that affect efficient preparation and testing on the CITR. The Advisory Board will consist of senior management representatives from the following organizations:

- Environmental, Safety, and Health
- Security & Emergency Services

- Facility/Operations Services
- Infrastructure/Homeland Security.

As needed for project-specific testing, other subject matter experts (SMEs) or managers may be requested to serve on the Advisory Board. Advisory Board members will also call on their organizational staff to recommend/consult with the Range Director Office on operational/testing issues.

The Range Director Office will consist of SMEs and administrative office staff, who will provide the following support/advisory functions:

- Environmental, Safety, Health, and Quality
- Facility/Area Operation and Maintenance
- Security
- Configuration Management
- Document Control
- Administration.

For individual projects, the PI and his or her technical staff are responsible for the testing of their technology and/or concept. They must keep the Range Director Office apprised of status (setup, testing, duration, and teardown) of the project and follow the established CITR protocol (Attachment A) for research, development, and testing at the CITR. Any operational issues/needs while working at the CITR can be coordinated through the Range Director Office. The Range Director Office should be informed as specific, nontechnical (ESH&QA, outside labor, etc.) support is brought to the CITR; however, specific client needs for the CITR must be communicated through the PI to the Range Director Office.

Note: Testing/training at the CITR is defined as those activities necessary to evaluate a technology, evaluate/demonstrate a concept, or evaluate/demonstrate processes (training, exercises, etc.).

2.6 Documentation Schedule

The INL CITR attempts to avoid excessive documentation whenever possible. Range customers are required to provide a program requirements document (PRD), or comparable document, to assist CITR personnel in defining support requirements.

Timelines can be compressed or expanded based on project size and complexity. Exact data requirements will be determined during the planning phase based on schedule and unique project details. INL encourages range customers to provide documentation as early as possible to ensure adequate time for review and approval of activities. Failure to do so could cause unnecessary delays.

2.7 Funding Information

INL is a DOE site that provides research and development services and solutions to other U.S. Government agencies, commercial organizations, and foreign governments. As a Government site, INL operates on a full-cost recovery basis. The PI will provide a project cost estimate for the requested support, and the range customer will be required to pay actual costs. INL recommends that funding be made available to DOE/INL at least 6 weeks before start of work on the project. Work cannot begin until funding has been processed. The funding transmittal processes are as follows:

Department of Energy organizations

- An agreed upon Statement of Work
- INL Cost Estimate
- Direct funds transfer
- Internal accounting processes established
- Work begins

Other Government agencies and Private Sector/Educational Institutions

- An agreed upon Statement of Work, including complete review of responsibilities of all participants
- INL Cost Estimate
- Work for Others (WFO) or Cooperative R&D Agreement (CRADA) documents
- Request for INL Services Form
- Funds Transfer Form transmittal to DOE-ID
- Internal accounting processes established
- Work Begins

Note: When intellectual property development is anticipated, using CRADA documentation is recommended.

2.8 Completion of Project

INL requests that at completion of a project the range customer provide feedback on the INL's support team and facilities performance in order to improve our processes and services.

3. TEST RANGE ADMINISTRATION AND LOGISTICS

3.1 INL Site and Town Access

The process for initiating a project at the INL CITR is as follows:

- Contact the INL PI to discuss the feasibility of the project
- Negotiate scope, cost, responsibilities, and schedule (INL visits are highly recommended)
- Provide project funding documentation, as explained in Section 2.6
- DOE will send the PI a letter stating project acceptance and work begins.

3.2 Entry Control

3.2.1 Initial INL Site Access

Admittance to INL and Idaho Falls facilities must be for official business only. All visitors are subject to search for prohibited articles before entry. The PI will collect personnel visitor information before the client's arrival. This information is sent to INL Personnel Security, and visitor badges are printed. Visitor badges will be available upon check-in at the respective site or town guard gates. All visitors must present a valid photo ID for positive identification. Valid badges from other DOE or DOD agencies will be honored at INL facilities. The PI will determine escort requirements.

Note: More stringent access rules apply to non-U.S. citizens. The PI will handle these situations before the scheduled visit.

3.2.2 Facility Access

Depending on the type and/or classification of the testing being conducted at any one of the test bed areas/facilities, access to that area/facility may be restricted. The PI(s) doing research/development/testing in a particular test bed/facility, along with the Range Director Office, will predetermine access requirements.

3.2.3 Security

A high level of security is necessary due to the nature of the INL and CITR mission. INL conducts research not only in various nuclear fields, but also in many other areas of national interest. Much of the work done here is on the edge of technological advancement and must be protected on a "need to know" basis. The Range Director Office, as requested by the PI or required for a particular test, will arrange for the appropriate level of security coverage.

3.2.4 Physical Security

The INL CITR and facilities are patrolled by INL's internal security force. All personnel and visitors must comply with any directions given by the INL security force.

3.2.5 Prohibited Articles

A list of prohibited items is posted at all facility points of entry. The list includes dangerous weapons, explosives, alcoholic beverages, or any dangerous instrument or material likely to produce substantial injury or damage to personnel or property.

In secure areas/facilities, cell phones, palm pilots, blackberries, laptop computers, cameras, and any other devices capable of recording information are prohibited.

3.2.6 Visitors

All non-INL visitors must sign in on a Visitor Traffic Log located at security guard posts, either in town or at the site. All non-INL visitors to the CITR must be escorted at all times by an INL employee, unless prior arrangements are made and proper security clearances are transferred to the DOE Security Office. Visits to the CITR by non-INL visitors should be coordinated through the Range Director Office.

3.2.7 U.S. Citizen Visitors

Visiting U.S. citizens must be escorted, either by INL or customer badged/escort-trained personnel. Provide full name, address, phone number, Social Security number, date of birth, any government clearance information, length of stay, and company affiliation to INL at least two days before the visit. This enables guards to have badges ready upon arrival. Photo ID (e.g., driver’s license) is required when signing the visitor log.

3.2.8 Foreign Visitors: Non-sensitive Countries

All foreign visitors must be escorted by INL personnel. Forms must be completed and issued to Security *30 days* in advance of a visit. Exceptions to this time requirement may be possible but are rare, and require senior INL and DOE management approval. The forms require detailed information. Foreign visitors who have not been processed cannot visit INL. Photo ID (a passport is preferred) is required when signing the visitor log. Off-range interactions between INL employees and foreign visitors are also managed.

3.2.9 Foreign Visitors: Sensitive Countries

All foreign visitors must be escorted by INL personnel. Forms must be completed and issued to INL Security *60 days* in advance of a visit. Exceptions to this time requirement may be possible but are rare, and require senior INL and DOE management approval. The forms require detailed information. Foreign visitors who have not been processed cannot visit INL. Photo ID (a passport is preferred) is required when signing the visitor log. Off-range interactions between INL employees and foreign visitors are also managed.

3.2.10 Sensitive Countries

The following are sensitive countries: Algeria, Armenia, Azerbaijan, Belarus, China, *Cuba, Georgia, India, *Iran, *Iraq, Israel, Kazakhstan, *North Korea, Kyrgyzstan, *Libya, Moldova, Pakistan, Russia, *Sudan, *Syria, Taiwan, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.

*This country appears on the State Department’s list of state-sponsored terrorist nations. All visits by citizens of state-sponsored terrorist nations must be approved by the Secretary of Energy.

3.2.11 Vehicles

Unless you are notified otherwise, use of government and private vehicles at the CITR is unrestricted. However, all vehicles are subject to search and seizure at the main guard gates at Central Facilities Area and Test Area North. As the national threat/alert level changes, or the INL security posture changes, use of private vehicles at the CITR may be restricted. In addition, depending on the type and/or classification of the testing being conducted, use of private vehicles may be restricted or limited in specific areas.

3.3 Badge Process

Permanent badges will be issued to customer personnel who are expected to visit INL on a frequent and continuing basis throughout the CRADA partnership. Only direct subcontractors or INL CRADA partners (i.e., those with contractual relations) can be issued permanent badges. Permanent badges require about four hours of training. They are valid for one year, after which they need to be returned or renewed. Qualifications through training expire each August and need to be renewed upon first opportunity.

Note: If you forget your badge three times in one year or lose it, your badge privileges will be revoked.

U.S. Citizens Customer Personnel:

- Contact the PI to discuss your case for having a permanent badge versus having a temporary badge, and whether escort privileges are desired. The PI is the sponsor for permanent badges and escort privileges.
- Fill out the subcontractor information package and return it to the PI at least three business days before your visit.
- The badging/orientation process is typically held on Monday mornings. Exceptional arrangements may be coordinated with the Range Director or PI.
- Escort training can be combined with badging/orientation training by special arrangement. Customers can escort only U.S. Citizens (customers cannot escort foreign nationals, whether the foreign national is a visitor or an assignee). Foreign nationals may be escorted by INL personnel only.

Foreign National Customer Personnel:

- Contact the PI to discuss your case for having a permanent badge versus having a temporary badge. The PI is sponsor for permanent badges.
- Members of nonsensitive countries must complete and submit forms to the INL Security office *30 days* in advance of receiving a badge; members of sensitive countries must submit their forms *60 days* in advance. Exceptions to this time requirement may be possible but are rare, and require senior INL and DOE management approval. The forms require detailed information. Foreign assignees who have not been processed cannot work at INL. Off-range interactions between INL employees and foreign visitors are also managed.
- A formal Security Plan must be in place before your visit and prebriefings held with all designated escorts and personnel within the approved unescorted access areas. As part of the Security Plan process, we will try to accommodate unescorted privileges as far as possible, but some areas may be strictly off limits or require escort.
- The Range Director's Office will maintain a file of all foreign national security plans.
- Fill out the subcontractor information package and return it to the PI at least three business days before your visit.
- Badging/orientation training is typically held on Monday mornings. Exceptional arrangements are coordinated with the Test Range Director or PI.
- *No* foreign national will be allowed escort privileges of any kind.

3.3.1 Customer Subcontract, Vendor, and Test Sponsor Personnel

If INL does not have a direct business relationship with the customer's subcontractor, vendor, or test sponsor, badge requirements will be discussed on a case-by-case basis. Customer's personnel escorting U.S. citizen subcontractors, vendors, or test sponsors will be responsible and accountable for their activities. Escort training is required.

3.3.2 Security Levels and Accreditation

Several INL facilities, both on the CITR property and in Idaho Falls (IF), support classified processing and discussion, up to and including level TS/SCI. Nearby facilities at CFA and PBF are currently rated for S/NSI. Both the CITR Range and Idaho Falls classified facilities have STU-III telephones available. In Idaho Falls, access is to both SIPRNET and the IC mail network, and to postal shipping addresses for classified materials.

3.3.3 Clearance Points of Contact

All tests must be coordinated with the Test Range Director.

Security Clearance POCs:

CITR: Jamie Stuart, 208-526-0577

Collateral: Jody Streier, 208-526-2932

SCI: Diane Teunessen, 208-526-2935; Alternate: Debbie Decoria, 208-526-3031.

3.4 Working Hours

The majority of INL Site workers work a 4/10 schedule: 7:00 a.m.–5:30 p.m., Monday through Thursday. Security personnel work 12-hour rotating shifts. INL town employees work a 9/80 schedule: 9 hours Monday through Thursday with every other Friday off (working Fridays are 8 hours). This work schedule will be followed during the performance of tests at the CITR unless critical testing activities dictate differently. Daily schedules will be determined between the PI and the range customer.

3.5 Airports

The Idaho Falls Regional Airport, Fanning Field, serves the Idaho Falls and surrounding areas. Runway dimensions include one at 9001 × 150 ft. (2744 × 46 m) and another at 4050 × 150 ft. (1234 × 46 m; thus, they are capable of accommodating most military and commercial carriers. It is located within the city limits of Idaho Falls and is about 50 miles from the INL CITR. For more information regarding our regional airport, visit: http://www.airnav.com/airport/IDA.

Idaho Falls Regional Airport, Fanning Field

2140 N. Skyline Drive

Idaho Falls, Idaho 83405

Phone, 208-529-1221.

3.5.1 Airspace Control or Restrictions

INL is part of the National Airspace (NAS) and is classified as a National Security Flight Area. INL, therefore, receives a special advisory for any flights over INL range property. Overflights are permitted, but depending on the altitude, some restrictions will apply. INL also has a special testing relationship with the Federal Aviation Administration center in Salt Lake City to coordinate test flights of unmanned aerial vehicles (UAVs) up to 1000 ft above ground level (work is underway to raise this limit). The UAV Test Director will coordinate all required flight activities.

3.6 Geography/Maps

INL is geographically isolated, 45 miles west of Idaho Falls, with no other major urban, military, or government facilities in the immediate area. U.S. Hwy. 20 West is a direct route to the INL Site and CITR.

Idaho Falls has a population of about 50,000, with a variety of shopping centers, casual and formal dining establishments, 14 screen movie theaters, etc. To learn more about the city of Idaho Falls, Idaho, visit www.visitidahofalls.com. Before your scheduled visit to the INL CITR, you will receive an information packet about INL, containing maps, area attractions, etc.

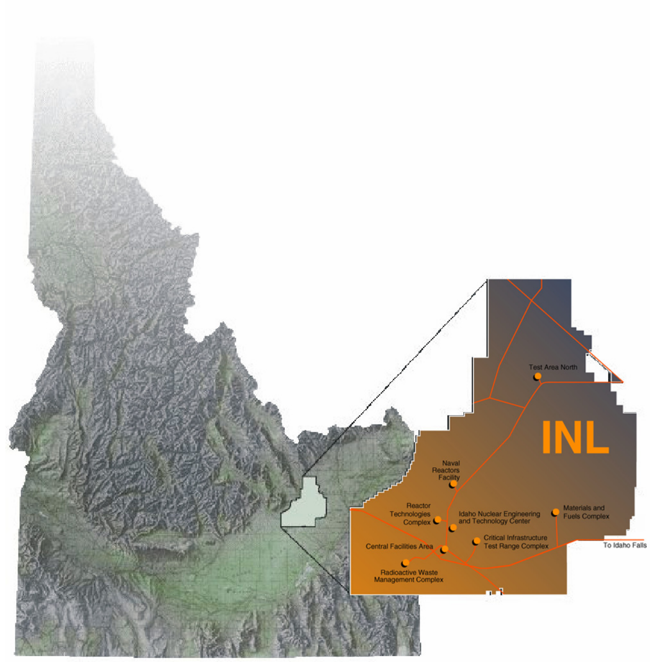


Figure 3. INL's geographic location in Southeast Idaho.

3.7 Transportation

Bus service for INL employees is provided to and from the INL site on a 4-day, 10-hour/day (4/10) workweek (Monday through Thursday). Non-INL individuals are required to provide their own transportation (visitor badges must be obtained at the main entrance to the site, and visitors to the CITR must be escorted by an INL employee). Work/testing outside the normal 4/10 site workweek will require personnel (INL staff and non-INL staff) to arrange for their own transportation to and from the CITR. During the work-week, taxi service is provided at some test bed areas and at the CITR for transporting personnel between facilities. At present, INL security allows personal vehicles to be driven to and used at the CITR. Some major areas of INL restrict private vehicle use around facilities. Depending on particular tests and the INL security situation, use of personal vehicles at any specific test bed may be restricted or limited. The Range Director and/or the assigned PI would communicate this information.

3.8 INL Dining Services

There is one primary cafeteria available on the Test Range. It is located at the Central Facilities Area, with hours of operation from 7:00 a.m. to 5:00 p.m., Monday through Thursday. Most office facilities throughout the Test Range have vending machines that provide soda, juice, and snacks.

3.9 Communication Services

Not all test beds or facilities at the CITR, especially in the CITRC area, have multicommunications capability. The wireless, cyber security, and SCADA test beds are the main test beds equipped with state-of-the-art communications equipment. All test bed areas have standard land line telephone hand set capabilities to accommodate emergency communications. Cell phone coverage is provided at the CITR, which includes individual test beds and the CITRC. Internet connectivity is not currently available in all test bed facilities; it is available in the office areas at the CITRC only. There are plans to upgrade the communications capabilities of the CITRC as the Range Control Center is constructed.

3.10 Smoking Policy

It is INL's policy to maintain a smoke-free work environment. Smoking is not allowed in any facility occupied or controlled by the company. Nor is smoking allowed in any company-operated vehicle, including, but not limited to, trucks, buses, taxis, and shuttle service vehicles.

3.11 Drug-Free Workplace and Substance Abuse

It is INL's policy to maintain a drug-free workplace. The company does not hire or retain employees who use, possess, or sell illegal substances. In addition, the company will not tolerate abuse of legal substances that adversely affect work productivity, safety, or one's overall performance. This policy also applies to CITR clients while conducting or participating in testing/training activities at INL.

3.12 Industrial Safety

Industrial safety procedures are typical of those enforced at other U.S. Government facilities. In addition, all personnel are expected to obey all work/process control signals and signs posted at INL facilities.

3.13 Fire Protection

INL has its own Fire Department/Hazardous Material Team, stationed at the Site for fire fighting response (one is at Central Facilities Area, one at Test Area North). This service is provided 24/7 to respond to fires and other emergencies. All facilities at INL have fire suppression systems installed/available. Installed/available systems depend on occupancy and function of facility; for example, small storage facilities have fire extinguishers only, whereas larger, manned facilities have installed wet/dry pipe systems.

3.14 Medical Facilities and Emergency Services

Medical services are available at INL Central Facilities Area (CFA) during normal Site work hours. Emergency medical services are dispatched from the CFA fire station (24/7). During normal work hours, emergency services are coordinated with the medical facility at CFA. In serious medical emergencies, persons are transported by ambulance to the regional hospital in Idaho Falls, Idaho. Emergency telephone numbers are as follows:

Town location, land line: 1-911

INL Site location: 777

Cellular phone: 911.

External customers conducting tests at the INL Site and reporting an emergency but who are not familiar with the demographics of the Site may wish to contact the INL Warning Communications Center (WCC) at 208-526-1515. The WCC will contact emergency services for you and can easily direct them to the correct facilities at the site.

Other medical dispensary locations include:

Willow Creek Building (WCB) – Town Location

Test Area North (TAN) – INL Site Location

Test Reactor Area (TRA) – INL Site Location

Idaho Nuclear Technologies (INTEC) – INL Site Location.

3.15 Shipping Information

Various shipping services are available, including United Parcel Service, Federal Express, and the U.S. Postal Service. The CITR client should use the following information when mailing correspondence or shipping equipment for official project business:

Correspondence Address: INL

[PI Name and mailstop]

P.O. Box 1625

Idaho Falls, ID 83415-____ [mail stop]

Town Shipping Address: INL

[PI Name and mailstop]

2525 Fremont Ave.

Idaho Falls, ID 83415-____ [mail stop]

Site Shipping Address: INL

[PI Name/Area/Bldg.]

CF 601 Warehouse

Scoville, ID 83415-____ [mail stop].

The PI will provide necessary mail stop, area, and building information for shipping.

3.16 Hazardous Material

All hazardous material must be packaged to conform to applicable Department of Transportation regulations. A Material Safety Data Sheet (MSDS) must accompany all hazardous materials shipped to the CITR. The CITR client must provide a "hazardous waste disposal inventory" if any hazardous material will be disposed of at the CITR. The PI will contact Waste Generator Services (WGS) to coordinate disposal of the waste.

Radioactive sources require approval from the INL Site-wide Source Coordinator's Office before arrival. The client must provide information concerning the intended use, source type, and quantity to the PI at least 90 days before shipment/arrival of the source. The PI will take care of the necessary paperwork required by the INL Radiological Control Department.

3.17 Material Handling Equipment

A variety of material handling equipment is available at the CITR, including forklifts, material moving tools, and hoisting and rigging equipment. The client must provide a list of equipment needs before arrival. If the client provides independent equipment and equipment operators, the client must also provide the proper certification papers for that personnel and equipment. Otherwise, the CITR will provide equipment and services upon request.

3.18 Customs

International shipments must clear U.S. Customs before arrival at the CITR. Arrangements for shipments directly from overseas to the CITR must be coordinated and approved by the U.S. Customs office before shipment.

3.19 Foreign Nationals

Foreign nationals must have obtained prior approval from DOE before visiting the CITR. The PI will coordinate these visits per MCP-296, *Processing and Approval or Foreign National Access*.

3.20 Public Affairs Support

The INL Public Affairs Office (PAO) is available to support CITR clients with media and guest relations. Requests for PAO support should be made through the PI.

3.21 Post Office

U.S. Postal Service mail receptacles are available at INL site and town facilities. Mail pickup and delivery services are available Monday through Thursday at site facilities and Monday through Friday at town facilities.

4. CITRC FACILITIES

The CITRC comprises four main areas (Figure 4–10):

1. Range Support Area, consisting of an office structure, training facility, area power substation, and area water supply system
2. National Contraband Detection and Testing Center
3. Incident Response Training and Testing Center, and Range Control Center (RCC) facility, consisting of Range Director's Office and other test bed development/testing
4. Special Programs and other testing.

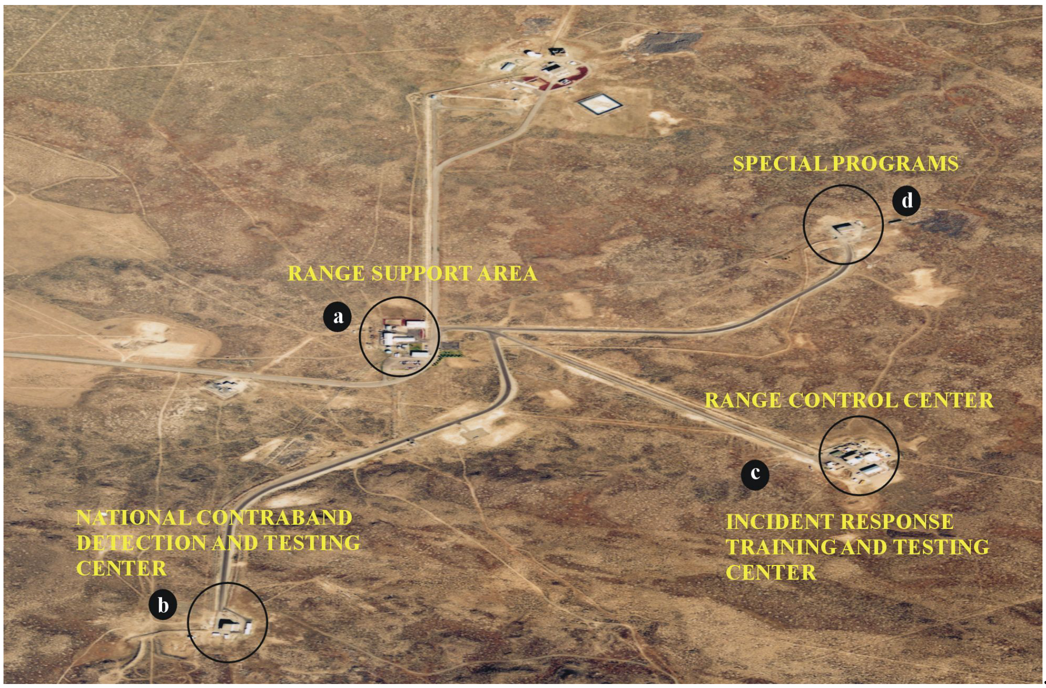


Figure 4. Critical Infrastructure Test Range Complex.

Figure 5. Range Control Area.

Figure 6. Range Control Center, Building PER-623.

Figure 7. Incident Response Training and Testing Center, Building PER-609.

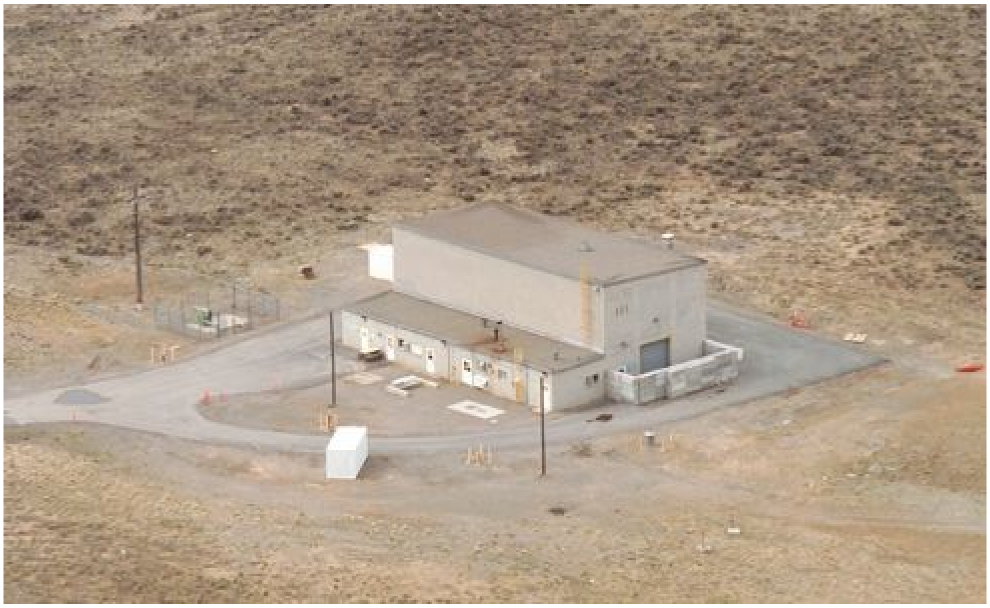


Figure 8. Special Programs Center, Building PER-612.

Figure 9. Range Support Administration Area, Building PER-632.

Figure 10. National Contraband Detection and Testing Center, Building PER-613.

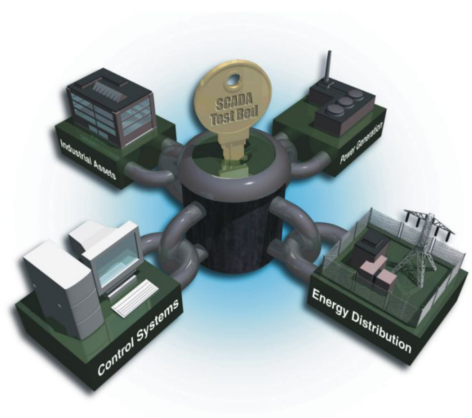
5. SUMMARY OF CITRC TEST BEDS

The test beds summarized here are expanded upon in the appendices indicated.

5.1 Wireless Systems (Appendix B)

The Communications Test Bed represents large-scale, independent, end-to-end testing of next-generation communication infrastructure, including 3rd and 4th generation cellular phone systems, land mobile radios and emergency communications systems, and wireless local area network systems.

5.2 Supervisory Control and Data Acquisition Systems (Appendix C)



The risks to the U.S. energy infrastructure from cyber attacks are real. One vulnerability is the communication and control systems used for planning, operating, and maintaining infrastructure grids.

INL's Control System and Cyber Security Test Center combines efforts in security administration and governance, standards, industry alliances, education and awareness, modeling, vulnerability assessment of U.S. utilities, and research and development.

The purpose of a SCADA Test Bed is to conduct tests to mitigate impacts to critical infrastructure and aggressively recover from attacks involving cyber or physical threats.

In addition, INL manages its own 50-MW power grid, providing the perfect testing ground for new power line-based communications systems. The grid includes 61 miles of electrical transmission lines in a dual loop configuration.

5.3 Cyber Security (Appendix D)

Cyber Security is all about protecting computers, communications, and the systems that they link. INL maintains multiple layers of firewalls, intrusion detection systems, hybrid systems, and encryption links for classified network operating environments.

5.4 Live Fire Test Range (Appendix E)

Since the events of September 11, 2001, Department of Energy nuclear facilities have reevaluated their protection strategies. DOE Headquarters and the Safeguards and Security programs at individual facilities have recognized the need to move to a more aggressive protection strategy. The strategy reconfiguration is driving more rigorous vulnerability assessments and the need to enhance the capacity to protect special nuclear material, deploy heavy weapons, and use explosive breaching techniques.

Due to their experience in Protective Force Training and Operations, and the facilities available for use, INL can apply the full strength of an integrated laboratory engaged in operations and manufacturing, and research and development.

5.5 Contraband Detection Test Bed (Appendix F)

Contraband penetrates our borders by way of various vehicles, packaging, and transportation methods. Detection of contraband is essential to the protection of our Nation's critical infrastructure. INL has developed various sophisticated sensors and detectors that can assist in the early detection of contraband before its infiltration.

Of equal importance, we must gain intelligence and be aware of risk factors and existing vulnerabilities. Real-world vulnerabilities and risk assessments can be modeled, tested, and validated at the INL CITR.

5.6 Unmanned Aerial Vehicles Test Bed (Appendix G)

INL uses UAVs for advanced government research, national security interest, and environmental monitoring purposes. In addition, INL is considering UAVs for perimeter and area-surveillance operations supporting site security.

5.7 Incident Response Training and Technology Test Bed (Appendix H)

INL has collaborated with the Special Programs Division at Dugway Proving Grounds (DPG), Utah, to offer training expertise and optimal training environments to military units, regional law enforcement, and the National Guard Weapons of Mass Destruction Civil Support Team. DPG specializes in the chemical/biological arena, and INL leads in the radiological realm. The WMD training currently delivered is a combination of comprehensive classroom training, practical exercises, and scenario-based field exercises. INL offers over five decades of experience in nuclear/radiological science.

INL Special Response Teams and other special groups use this test bed for "force-on-force" training exercises and could offer unique challenges to clients with a similar mission.

In addition to training, INL performs various research and development tasks to enhance and/or integrate exiting systems and technologies to further sustain the military and emergency first responders' mission.

5.8 Power Grid Test Bed (Appendix I)

Real liabilities exist for the physical security and interconnectivities of power system components and infrastructure all over the world. At the CITR, various power grid test beds will process vulnerability information for secure power lines, real-time grid monitoring and control, and rapid electrical service recovery.

5.9 Physical Security Test Bed (Appendix J)

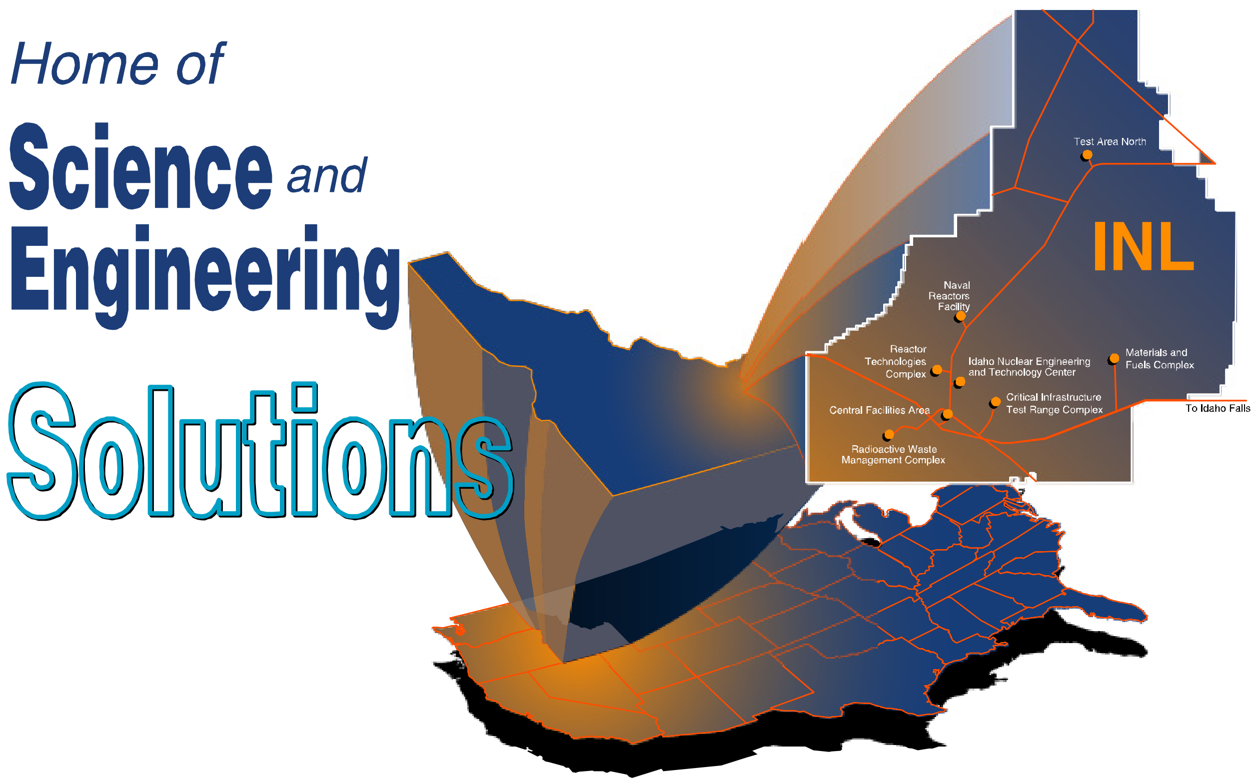
The concept and necessity of "physical security" is absolutely intermingled into every test bed at the INL CITR. Every system worth protecting relies heavily on physical security. Security of critical infrastructure includes, but is not limited to, people, weapons, physical or virtual barriers, sensors, sophisticated instrumentation, protective materials, and other administrative procedures.

The world changed on 9/11. The terrorist attacks opened the Nation's eyes to a vulnerable United States. Not only our people, but also the very infrastructure that supports our society and our values, are now perceived as vulnerable. Identifying these vulnerabilities is our first defense in battling physical security challenges.

INL not only conducts research and development of state-of-the-art physical security systems, but the CITR also tests new and existing systems to ensure that people and infrastructure are no longer vulnerable.

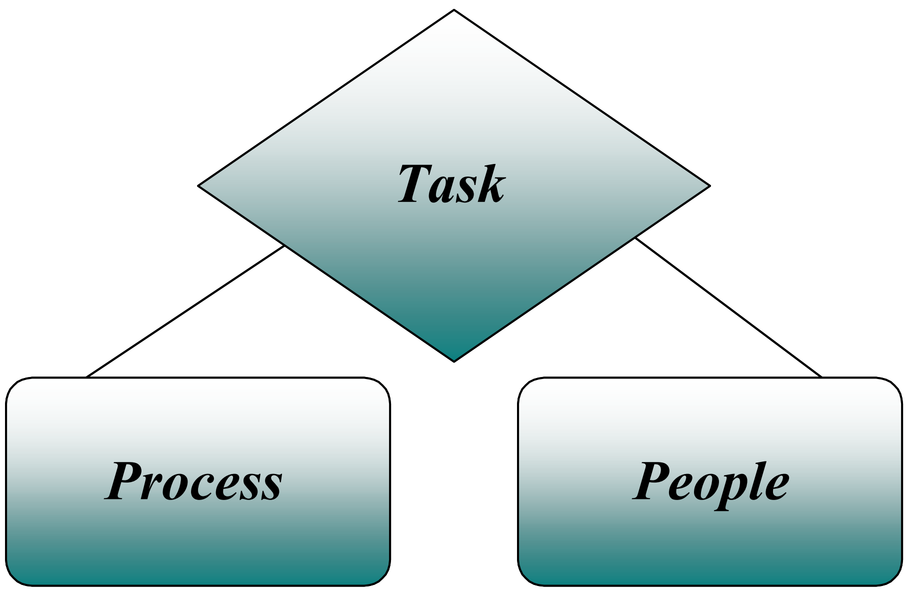
Appendixes

The INL…



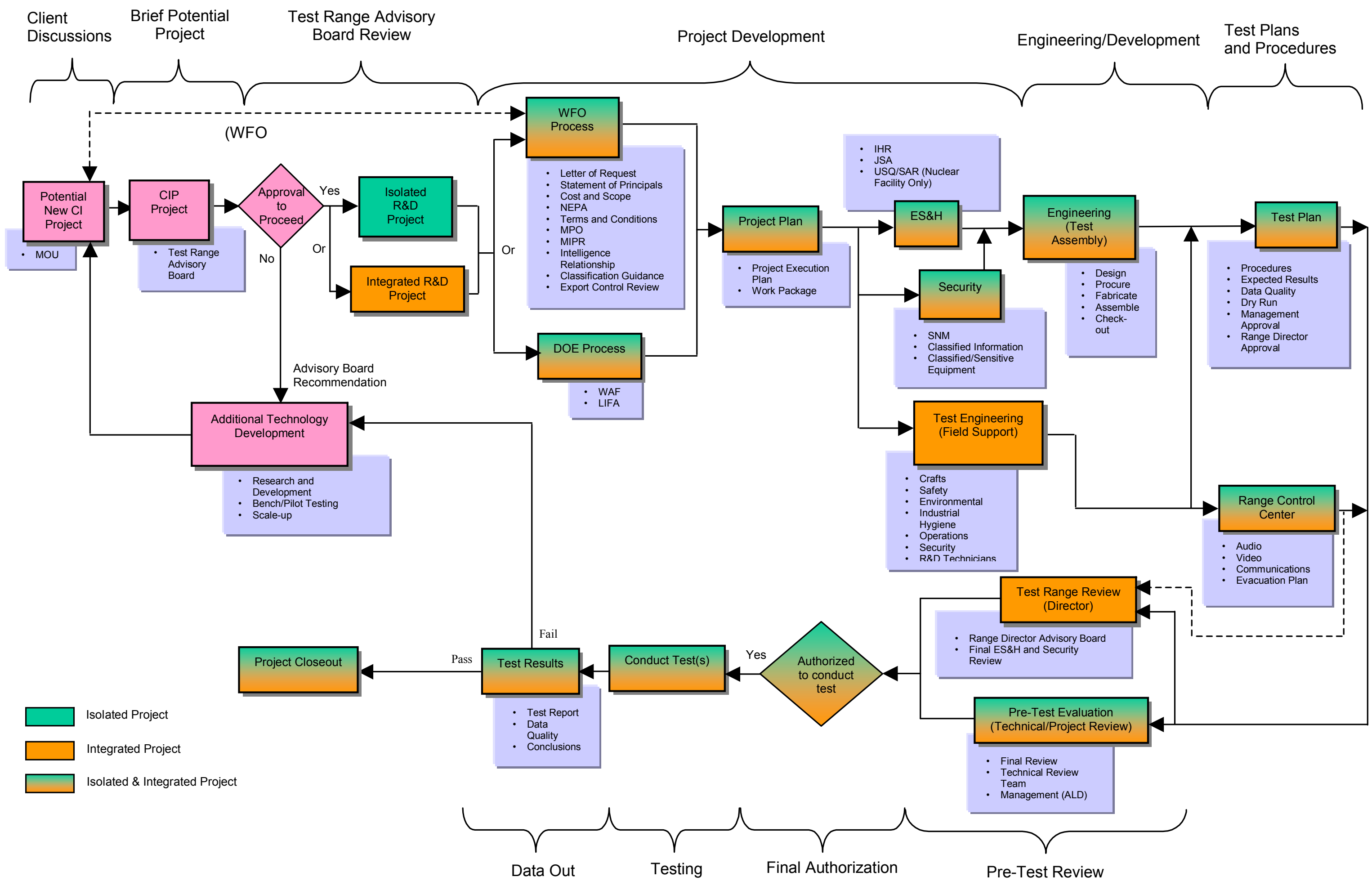
Appendix A

Critical Infrastructure Protection Test Range Protocol
Isolated or Integrated R&D Project



Appendix A

Critical Infrastructure Protection Test Range Protocol
Isolated or Integrated R&D Project



Appendix B

Wireless Test Bed

Appendix B

Wireless Test Bed

B-1. INTRODUCTION

INL's Wireless Test Bed (WTB) offers large-scale, independent, end-to-end testing of wired and wireless next-generation communication infrastructure, including 3G/4G cellular, land mobile radios, and wireless local area network systems. The WTB owes its existence, in part, to INL's status as a National Telecommunications Information Administration test station. This allows the test bed, in coordination with a local spectrum manager acting for the chief information officer at DOE's Idaho Office, to use most frequencies of interest for testing purposes.

The INL team of researchers and engineers initially constructed three cell towers across 16 square miles at the Central Facilities Area on the INL CITR and provisioned them with various radio equipment, test equipment, and modeling/simulation tools. The WTB opened for business April 1, 2003, based on internationally dominant GSM standards, and engineers immediately conducted tests for new distributed antenna systems for AT&T Wireless Systems. Now, the cellular test bed supports several commercial and government customers for USM, GPRS, and EDGE systems. More towers and national/international cellular technology variations (CDMA and UMTS) are planned for the near future. Using INL-based switches, all testing can be either isolated from the Public Switch Telephone Network or combined with other laboratories/switches scattered about the nation. It can also be linked into other SCADA and Cyber Test Bed assets (such as GSM cellular-based RTUs, or WLAN-based smart relays).

Other INL communications assets include two mountain-top RF transmission facilities, the digital Land Mobile Radio Test Bed, Wireless LAN Test Beds, Wireless Metropolitan Area Networks, Outdoor Antenna Test Area, anechoic RF chambers, and 170 high-speed fiber loops—all managed and controlled by INL. Anticipated areas for testing include base station equipment, smart antennas, handsets, fiber technologies, free space optics, UAV communications on and about commercial infrastructure, interoperability and security of new systems and standards, and converged voice/data networks (next-generation nets).

INL also supports the Department of Homeland Security's fielding of the new Wireless Priority Service for National Security Emergency Preparedness (NS/EP) cell phone users (GSM and CDMA), and the newly proposed Internet Priority Service for NS/EP users of data, converged networks, and, possibly, priority signaling for energy data networks.

B-2. PURPOSE

Third and fourth (3G/4G) systems are expected to greatly transform our Nation's communications infrastructure and the types of services it provides. There is no single source for all the telecom equipment needed for these technological upgrades, and no one entity is providing end-to-end testing or independent validation. The reasons are numerous and include rapidly changing technology, lack of a single national or international transmission standard (TDMA, GSM, GPRS, EDGE, CDMA, Bluetooth, etc.), problems getting FCC frequency bands, finding geographically isolated and low-noise RF test areas, and controlled access to isolated high-speed networks.

As a large, federal reservation and multiprogram laboratory spanning an immense area, INL can provide all these capabilities in one isolated location. INL maintains independent status as a government laboratory and has over 50 years experience in independent validation and verification for military, Nuclear Regulatory Commission, and other government and commercial customers.

B-3. WTB LOCATION

The WTB is located in southeastern Idaho on the 890-square-mile INL Reservation at CITR, 45 miles west of Idaho Falls. INL is geographically isolated, having no other major urban, military, or other government facilities in the area.

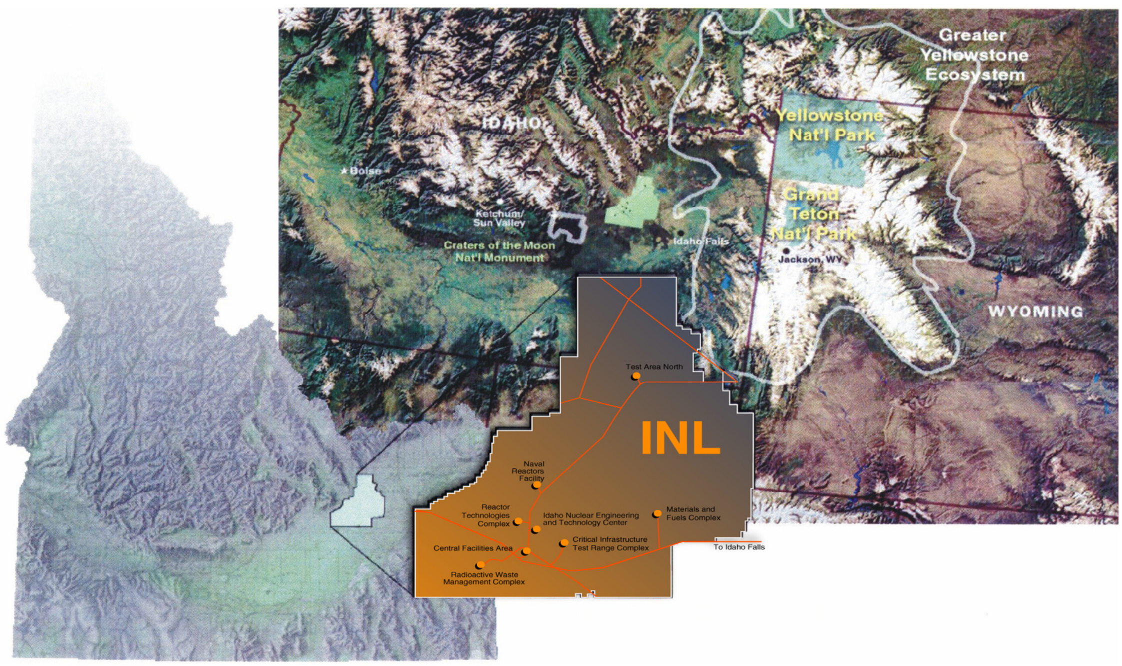


Figure B-1. The Department of Energy's national laboratory reservation in Southeastern Idaho.

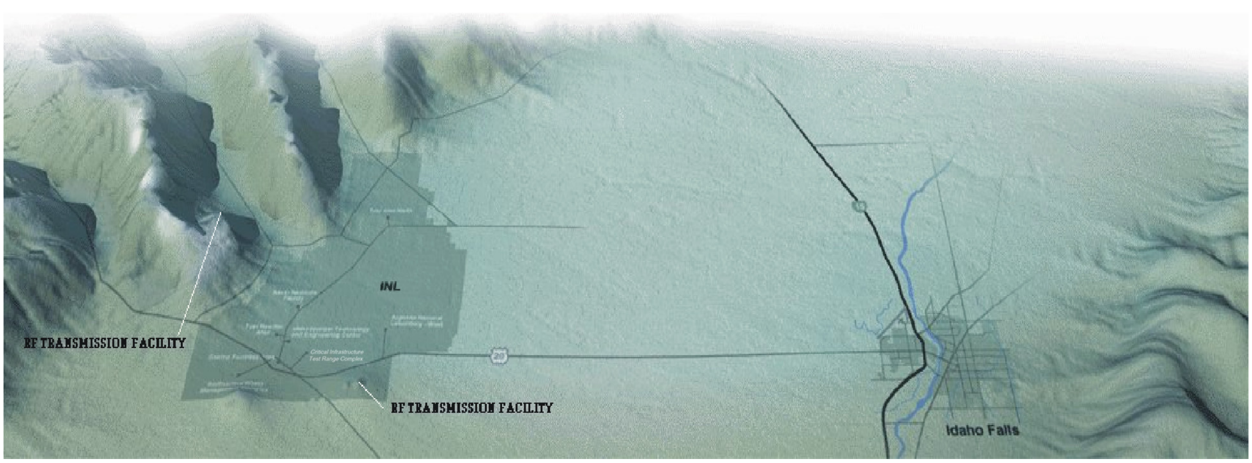
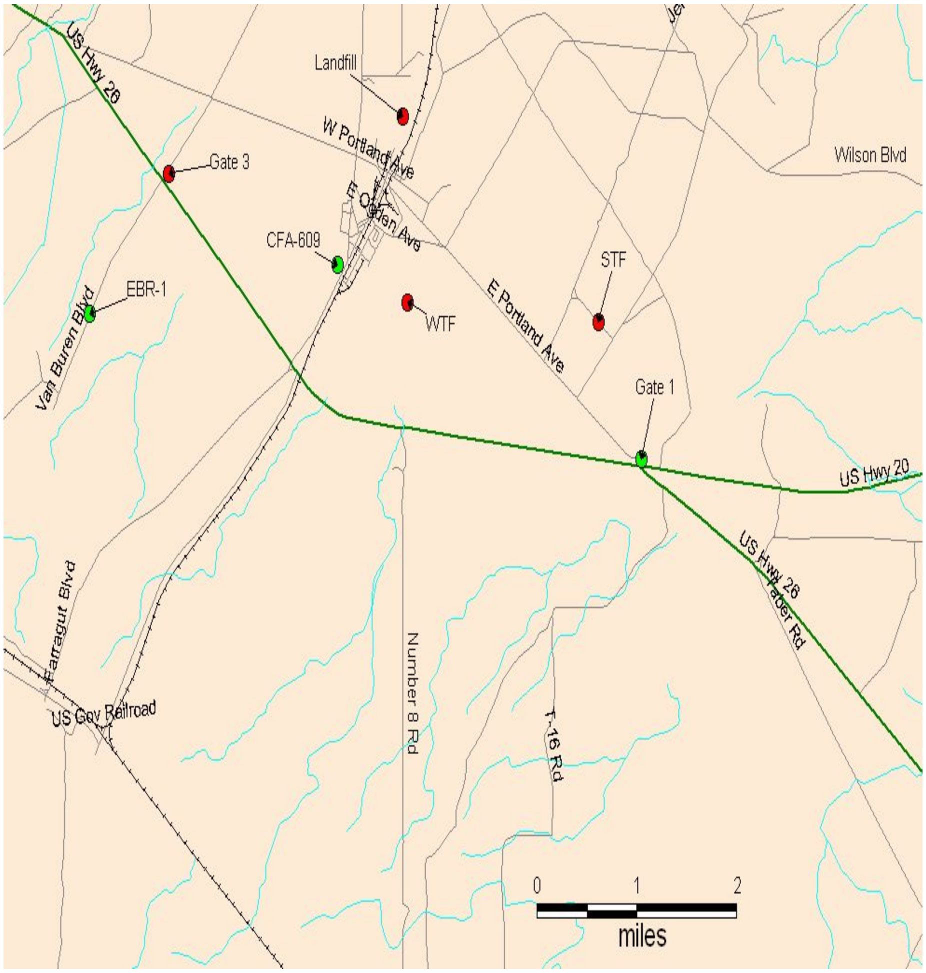


Figure B-2. Location of the DOE INL Reservation.

The WTB is located in the southern portion of the INL Range (see Figures B-3 and B-4). It currently consists of a cellular network of three GSM cell sites:



Cell Site 1

- CFA 609 (Hub)
- Ground Elevation (mean sea level): 4999 feet

Cell Site 2

- Gate 1
- Located 2.85 miles from the hub
- Ground Elevation (mean sea level): 4993 feet

Cell Site 3

- EBR-1
- Located 2.56 miles from the Hub
- Ground Elevation (mean sea level): 5061 feet

Figure B-3. Wireless Test Bed Cell Locations.

Current WTB Cell sites are indicated by green dots. The red dots indicate potential future WTB Cell sites in the southern area of the INL range that were investigated. The northern area of the INL range could also support new sites on a separate grid.

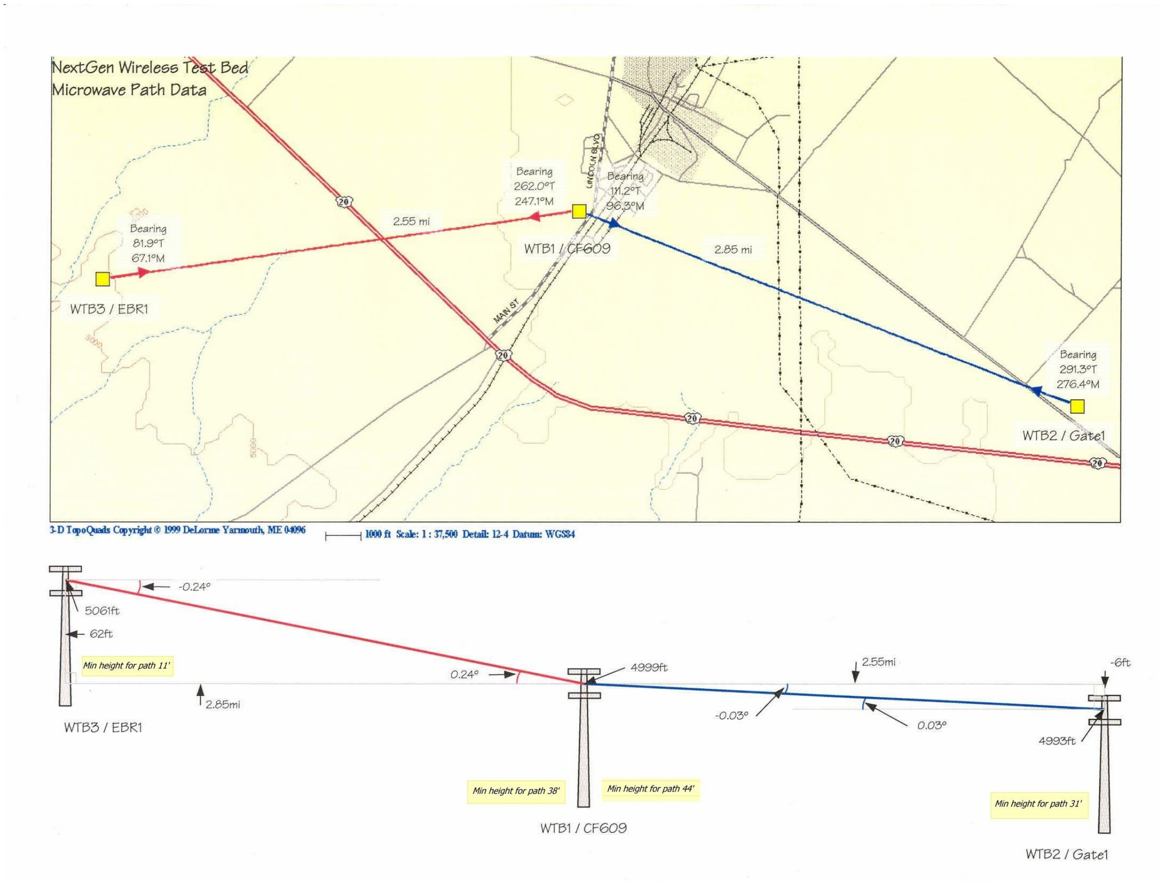


Figure B-4. Current WTB Cell site locations and path distances.

Figure B-5. WTB EBR 1 Cell site, equipment enclosure, and monopole.

B-4. ORGANIZATION

Points of Contact:

- WTB Organization Sponsor: Jane Gibson, Department Manager
  Jane.Gibson@inl.gov
  208-526-3131
  MS-3779

- WTB Program Manager : Wayne Austad
  Wayne.Austad@inl.gov
  208-526-5423, cell 208-520-8641
  SIPRNET: wqa@idaho.doe.sgov.gov   JWICS: id2auswr@doe.ic.gov
  MS-3779

- WTB Test Director: Lynda Brighton
  Lynda.Brighton@inl.gov
  208-526-3908, cell 208-520-3006
  MS-3779

- WTB Facility Director: Steven Williams
  Steven.Williams@inl.gov
  208-526-2034, cell 208-520-1124
  MS-3779

- WTB Staff Administration: Margy Blackburn
  Margy.Blackburn@inl.gov
  208-526-4758
  MS-3779

General Mailing Address:

INL, National Security Division
P.O. Box 1625, MS-<insert Mail Stop>
Idaho Falls, ID, 83415

B-5. TEST BED PROCESSES AND SCHEDULING

See *INL CITR User’s Manual*.

B-6. SECURITY REQUIREMENTS

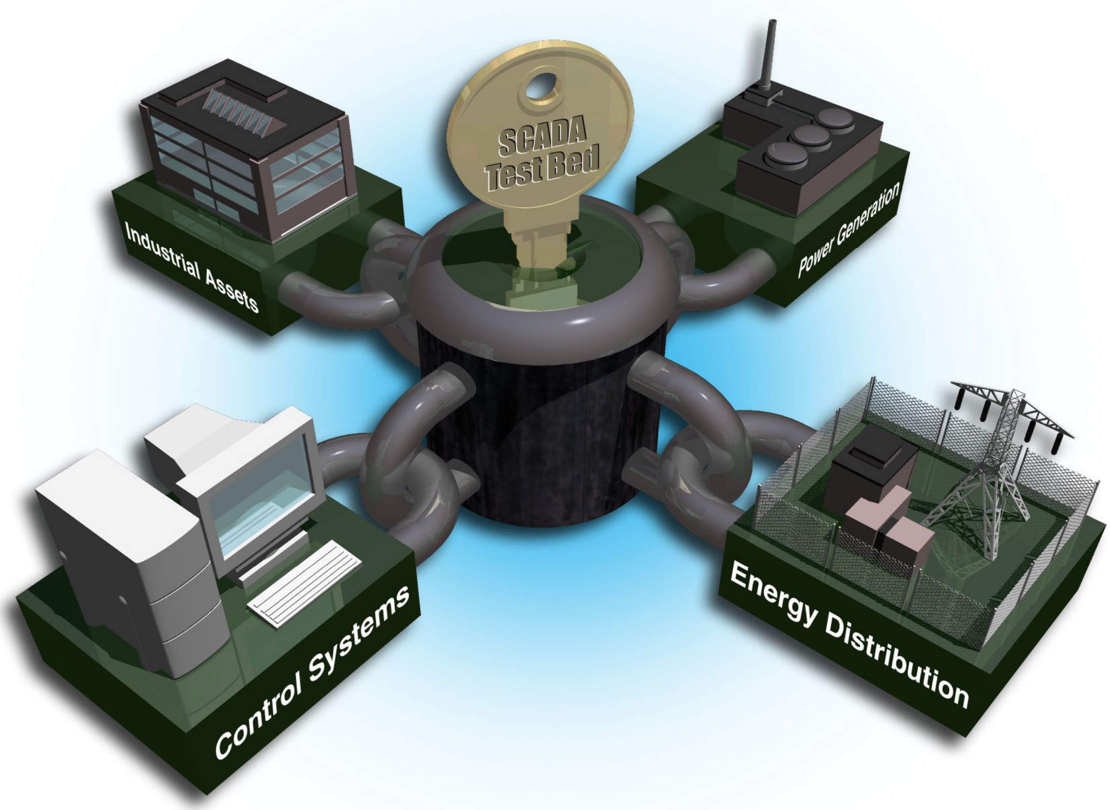
The three WTB Cell sites do not require special clearance to gain access. If sensitive/secure requirements are inherent in the planned tests, the WTB Test Director will work with the customer to accommodate their requirements. If access to INL secure facilities is required, individual clearances would have to be forwarded to appropriate INL security personnel. *All visits and tests need to be coordinated with the WTB Test Director*; the WTB Program Manager can provide security clearance points of contact.

B-7. INFORMATION AND REPORTING

Information and reporting requirements may differ with each test bed and each client.

Appendix C

Control System and Cyber Security Test Center



Appendix C

Control System and Cyber Security Test Center

C-1. INTRODUCTION

INL has established a comprehensive infrastructure test center, housing supervisory control and data acquisition (SCADA) systems, process control equipment, and cyber security research programs. It combines research in security administration and governance, standards, industry alliances, education and awareness, modeling, and vulnerability assessments of U.S. utilities with current state-of-the-art research and development techniques. The INL CSCS Test Center aligns with Homeland Security activities in physical security, certification, and system reliability of the Nation's service and distribution infrastructures.

C-2. PURPOSE

The Executive Order on Critical Infrastructure Protection, Executive Order 13231, states the Department of Energy (DOE) is to play a key role in protecting the Nation's critical infrastructure as specified in the National Energy Strategy for Homeland Security.

The INL CSCS Test Center Charter is to “Provide a nationally recognized CSCS Test Center that supports the Department of Energy and the Department of Homeland Security Critical Infrastructure Protection Strategy for the Nation's process controlled infrastructure. A Strategy implemented by utilizing the INL's real-world testing environment, using resources of multiple National Laboratories, and partnering with Industry to better define security standards, procedures, and equipment that will ensure the security of the Nation’s Critical Infrastructure now and into the future.”

C-3. CSCS TEST CENTER LOCATION

Unlike the INL CITR, which is located 45 miles west of Idaho Falls, the INL CSCS Test Center is located in Idaho Falls proper, not far from Interstate 15 and the Idaho Falls Regional Airport.

The Test Center address is:
INL Bldg 608
1155 Foote Drive
Idaho Falls, Idaho 83402.

The Test Center is close to many hotels, rental car agencies, the city's greenbelt, and downtown area where there are many unique restaurants, shops, and boutiques.

C-4. CSCS TEST CENTER ORGANIZATION

CSCS Test Coordinator
Alan Snyder 208-526-1725
MS: 2604
Alan.Snyder@inl.gov

The INL CSCS test coordinator is responsible for overall testing and training activities at the INL CSCS Test Center.

Each principal investigator (PI), SCADA, Process Control, Cyber Support, etc., ensures that support personnel have the necessary expertise and have the authority to direct resources commensurate with carrying out required responsibilities in accordance with scheduling and funding constraints.

C-5. CSCS TEST CENTER SCHEDULING

All testing activities are coordinated with the test coordinator to ensure there are no conflicts with using the test center equipment or INL CITR facilities. Activities involving the CITR are coordinated with the CITR Test Range Director.

C-6. CSCS TEST CENTER SECURITY

Security for the center is in accordance with the security section of the *Critical Infrastructure Test Range Users Manual*. Each process control system at the Test Center has its own private test area. The PI or test coordinator determines which personnel are approved for each test area.

Personnel assigned to perform work on a specific control system are required to read the appropriate CRADA and sign an acknowledgement of such before gaining access and starting work. The PI is responsible for ensuring this requirement is met and all testing participants are fully aware of the nondisclosure agreements between the process control partner and INL. He or she will maintain the record of acknowledgements.

C-7. CSCS TEST CENTER CYBER SECURITY TESTING

The process of maintaining the functional operations of the process control systems and the overall testing of the security of process control equipment at the Test Center is the responsibility of the PI for each specific system. Under direction of the Cyber PI, the Cyber Security Team will perform testing of the process control equipment to the following goals:

- Identify potential security vulnerabilities

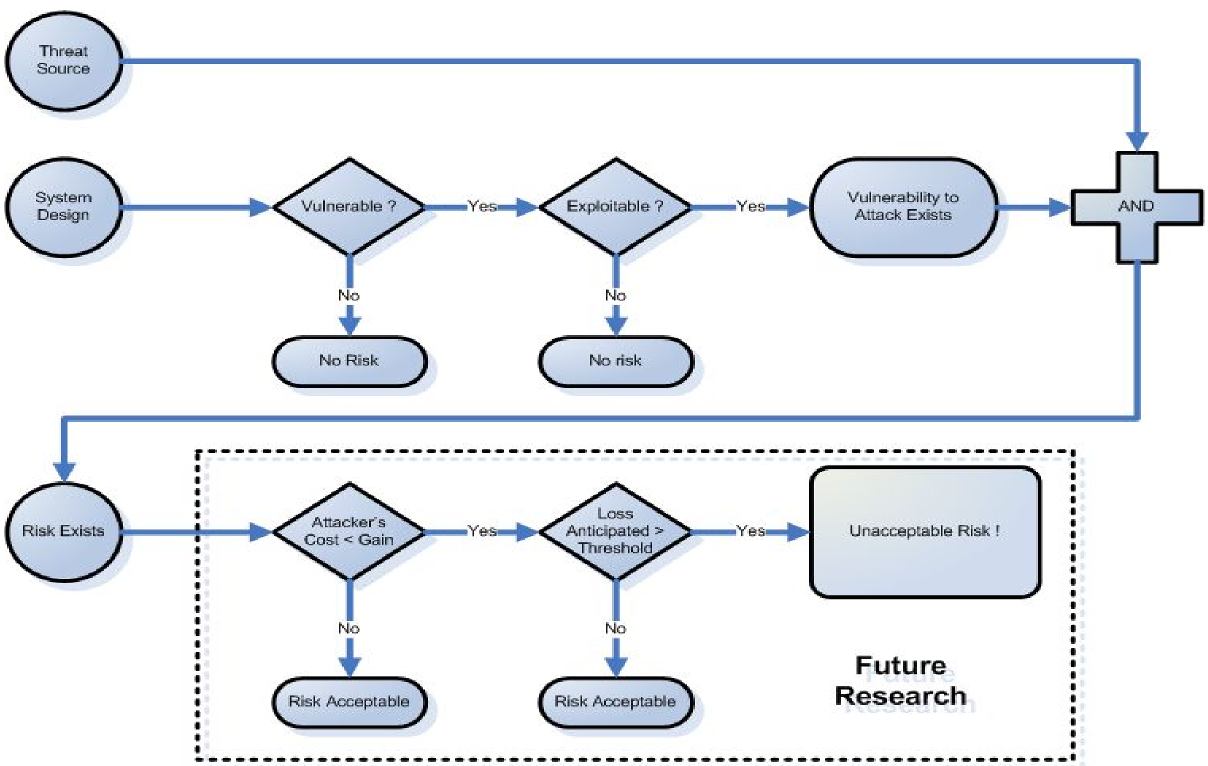
  Note: *A* vulnerability *is defined as any weakness that can be exploited to gain access or a flaw in software programming that allows attackers to gain unauthorized access to a computer and perform such actions as viewing, appropriating, or modifying data and/or launching service attacks.*

- Provide repair and prevention recommendations subsequent to the findings
- Provide lifecycle support, risk assessments, system audits, and applicable field-testing support.

The Cyber Security Teams will incorporate into their testing strategies known security tools in their attempt to analyze the security vulnerabilities of their respective control systems.

C-8. CSCS TEST CENTER SECURITY TESTING PROCESS

The normal testing processes of determining whether a system is a security risk entails using the following process flow chart:*



*Risk remediation and mitigation decision process from *NIST Risk Management Risk Management Guide for Information Technology Systems*.

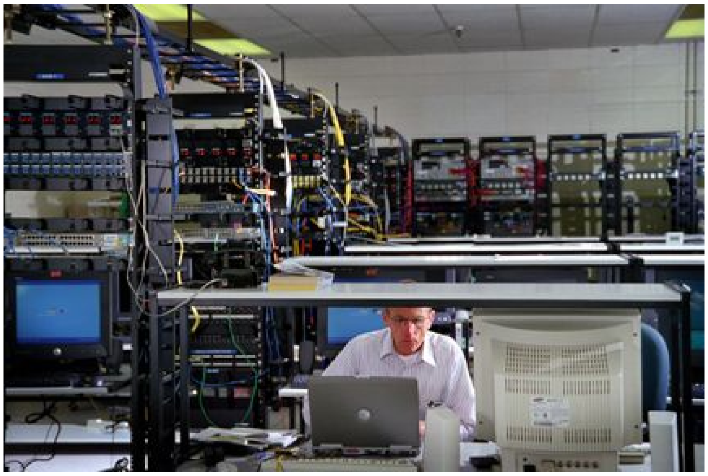
Appendix D

Cyber Security Test Bed

Appendix D

Cyber Security Test Bed

D-1. INTRODUCTION



The existing Cyber Security Test Bed was originally constructed as a network test laboratory designed to mock up the diverse network topologies that connect computing resources across INL site and town facilities. Since its creation, this resource has been used to test firewall configurations, perform non-disclosure vendor evaluations, and to reverse engineer the propagation methods of malicious code. INL computer engineers have been working with several agencies during the past year to leverage not only the laboratory facility, but also the INL technical expertise involved in conducting these activities.

D-2. PURPOSE

As governmental agencies assemble off-the-shelf and custom components into a working architecture, the composite system becomes more complex and potentially vulnerable. These entities need—and are in many cases required to obtain—a security validation of their architecture. These agencies have such requirements as proprietary or classified systems that make it hard or impossible to use a commercial service. In addition, some agencies investigate offensive cyber tool creation. INL is qualified and well positioned to respond to these missions.

D-3. CYBER SECURITY TEST BED LOCATION

INL Bldg 608
1155 Foote Drive
Idaho Falls, Idaho 83402

D-4. CYBER SECURITY ORGANIZATION

Robert W. Hoffman
Department Manager
Robert.Hoffman@inl.gov
208-526-8599

Trent Nelson
Cyber Testing Team Lead
Trent.Nelson@inl.gov
208-526-2512

Karen Hsu
Cyber Test Bed Coordinator
Karen.Hsu@inl.gov
208-526-1953

D-5. TEST BED PROCESSES AND SCHEDULING

All Cyber Testing activities taking place within the Cyber Test Bed are scheduled with the CSCS Test Coordinator and the Cyber Test Bed coordinator to ensure there are no conflicts with ongoing tests and that necessary equipment is available.

D-6. TEST BED SECURITY REQUIREMENTS

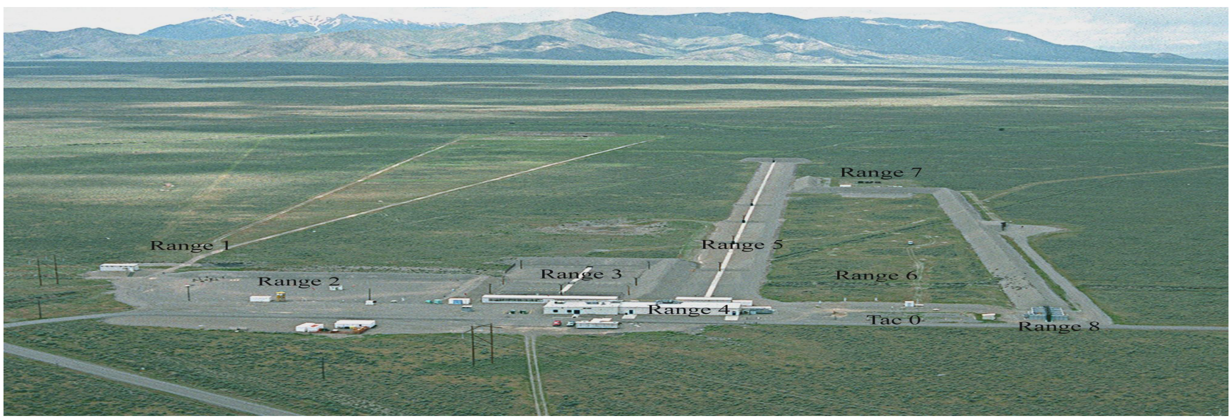
Security for the center will be in accordance with the security section of the *Critical Infrastructure Test Range Users Manual*. Currently, there are no unique security requirements for this Test Bed; however, the nature of the project may dictate more rigorous or stringent security requirements, which will be determined by the customer, Cyber Security Department staff, and respective principal investigator.

D-7. INFORMATION AND REPORTING

Information and reporting protocols will be directed by client-based requirements.

Appendix E

INL Live-Fire Test Range



Appendix E

INL Live-Fire Test Range

E-1. INTRODUCTION

The Live-Fire Range complex comprises 330 acres of isolated, desert terrain. The facility supports training and testing of handguns, rifles, and heavy weapons, such as machine guns, precision rifles, grenade launchers, and shoulder-fired anti-armor weapons. Explosive training and testing, including breaching, may be conducted. Research and development testing is also conducted.

- Range 1 is about 1,200 yards long and is primarily used for heavy weapons, such as machine guns, grenade launchers, and shoulder-fired anti-armor weapons.
- Range 2 is primarily used for shooting steel targets and for conducting training and testing that requires the shooter to move and to engage moving targets.
- Range 3 can support calibers ranging from handguns up to and including the 50-caliber rifle.
- Range 4 is an indoor range that may be used during inclement weather and to simulate daylight, reduced light, and no-light conditions. This range is also used to conduct testing in specifically controlled environments.
- Range 5 is 800 yards long and is used for precision rifle training, qualifications, and testing.
- Range 6 is about 500 yards long, designed to provide tactical training in a desert environment. The range has a moving target system with pneumatic steel targets that support tactical training.
- Range 7 is used for explosive training and testing, including ballistic breaching. A 6 × 6 × 12-ft steel building with double-pane Plexiglas windows may be used for observation.
- Range 8 is the Live-Fire Tactical Training Facility, which is used for conducting training on building entries with either lethal or nonlethal rounds. The facility is designed to contain rounds fired in any direction. It includes seven rooms, a hallway, and an elevated observation control platform.

E-2. PURPOSE

The purpose of the INL Live-Fire Test Range is to provide:

- Firearms and tactical and breaching training
- Testing of explosive breaching techniques
- Live-fire tests with explosively formed projectiles
- Vulnerability assessments and analysis of contraband weapons
- Computer modeling and simulation to investigate impact phenomena
- Testing of new weaponry, armor materials, projectile capabilities, mobile robots, and more.
- Due to the remoteness of the facility, possible evaluation of highly sensitive items.

Support resources include:

- Technical expertise in handling high explosives and disposal of spent targets
- Technical expertise in a wide range of firearms and ammunition
- Memorandums of Understanding with several federal, state, and local agencies for support as needed
- On-site fabrication shops for support of target mock-ups.

E-1. TEST BED LOCATION

INL CITR, Central Facilities Area, CFA-609

E-2. LIVE-FIRE TEST RANGE ORGANIZATION

Principal Investigator, Joan Pechtel
Joan.Pechtel@inl.gov
208-526-2693
208-521-2793, cell

E-3. TEST BED PROCESSES AND SCHEDULING

Agencies must have a Firing Range Agreement approved by DOE-ID S&S Special Services Division. Once this document has been approved, the agencies may contact Joan Pechtel to coordinate use of the facility.

E-4. TEST BED SECURITY

Non-U.S. citizen visitors and assignees must obtain Physical Security and INL laboratory director approval before any access to the facility is allowed. All uncleared visitors are required to be under continuous escort while in the area. Visitors without a picture pass or all the necessary site access and safety training will be escorted at all times by a Live Fire Range Complex Training Staff Employee. Addendums to the Security Plan may be required.

E-5. INFORMATION AND REPORTING

If desired, written reports concerning individual or team performance, as well as results from specific testing can be provided.

E-6. Firing Range Use Agreement

A Firing Range Use Agreement is required for every test or training conducted at this test bed. See the full agreement below:

FIRING RANGE USE AGREEMENT

The parties to this Agreement are the United States Department of Energy, Idaho Operations Office ("DOE") and_______________________ ("Permittee"), acting through their authorized representatives.

BACKGROUND

DOE owns and operates a firing range complex, along with related facilities and equipment within DOE's Idaho National Laboratory. These facilities, referred to in this Agreement as the *firing range*, are operated by a DOE contractor. That contractor and any subcontractor and their respective employees are referred to in this Agreement as the *Firing Range Operator*. Permittee has asked DOE for permission to enter upon and use the firing range, from time to time, in conjunction with its weapons training activities.

In consideration of the promises and statements of DOE and Permittee in this Agreement, the parties agree to the following:

AGREEMENT

DOE grants permission to Permittee to enter upon and use the firing range, at such times as DOE may authorize, subject to the following conditions:

1. Unless waived by DOE on a case-by-case basis, Permittee will give the Firing Range Operator at least 10 days advance notice of a request to use the firing range. This advance notice shall include the planned courses of fire.

2. Permittee accepts the firing range in its existing condition and acknowledges that no warranty, express or implied, nor any other representation has been made regarding the condition of the firing range, nor that use of the firing range by Permittee will accomplish Permittee's intended objectives. In addition, **NO WARRANTY OR REPRESENTATION HAS BEEN MADE THAT THE FIRING RANGE IS SAFE OR THAT USE OF THE FIRING RANGE WILL NOT RESULT IN INJURY, DEATH, OR PROPERTY DAMAGE.**

3. Permittee and its employees, agents and contractors will use the firing range for authorized and lawful purposes only. Permittee will follow all rules, regulations and procedures governing the use of the firing range, to include but not limited to, use of personal protective equipment and safe operation, handling, and use of any and all weapons. If the firing range is used for an unauthorized or unlawful purpose, or if any rules, regulations, or procedures governing use of the firing range are not followed, the permission granted in this Agreement may be immediately revoked by DOE or its firing range operator.

4. Permittee is solely responsible for the supervision of every person authorized by Permittee to enter upon and use the firing range. In addition, every person authorized by Permittee to enter upon and use the firing range is, during the conduct of firing activities, under the command and control of the firearms instructors and range masters employed by the Firing Range Operator.

5. Permittee is fully aware of the risks and hazards associated with entry upon and use of the firing range, and Permittee elects for itself and its employees, agents and contractors to voluntarily enter upon and use the firing range with full knowledge of those risks and hazards. Further, Permittee understands that it has an affirmative obligation to inform all persons authorized by Permittee to enter upon and use the firing range of those risks and hazards. **PERMITTEE VOLUNTARILY ASSUMES ALL RISK OF LOSS RESULTING FROM ANY DAMAGE TO PROPERTY OR FROM PERSONAL INJURY OR DEATH THAT MAY OCCUR AS A RESULT OF OR INCIDENT TO ITS ENTRY UPON OR USE OF THE FIRING RANGE.**

6. Permittee agrees to replace or repair any property (including firing range property) lost, damaged, or destroyed resulting from or incident to entry upon or use of the firing range by Permittee and its employees, agents, and contractors.

7. Permittee agrees to indemnify and hold harmless the United States Government and its contractors (including its firing range contractor) from any and all liability for property damage, personal injury, or death resulting from or incident to entry upon and use of the firing range by Permittee and its employees, agents, and contractors.

8. The parties to this Agreement will give prompt written notice to the other party of any action, suit, administrative proceeding or other claim resulting from or incident to the use of the firing range by Permittee. Upon request, all nonconfidential written documentation on the claim will be promptly given to the other party.

9. Permittee has examined and understands all rules, regulations, and procedures that apply to its use of the firing range, including but not limited to the Standard Operating Procedures of the firing range operator, or any successor document. Permittee agrees to review all rules, regulations, and procedures governing its use of the firing range with all employees, agents, and contractors of Permittee who enter upon and use the firing range. Permittee further agrees that each employee, agent, and contractor who enters upon and uses the firing range must understand the rules, regulations, and procedures before Permittee will authorize use of the firing range by that employee, agent, or contractor.

10. Permittee and its employees, agents, and contractors will also abide by all other rules, regulations, and procedures imposed by DOE for security purposes.

11. This Agreement represents the complete agreement of the parties.

12. Amendment of this Agreement must be in writing and signed by the parties in order to be effective.

13. This Agreement is binding upon the parties and their assigns.

14. If any part of this Agreement is ruled to be unenforceable by a court of competent jurisdiction, the part ruled to be unenforceable is removed from the Agreement, but all remaining parts of the Agreement shall continue to be valid and enforceable.

    In signing this Agreement, the representative of Permittee declares that:

    a. He or she is 18 years old or older and of sound mind;

    b. He or she is authorized by Permittee to sign this Agreement and to bind Permittee to all terms of this Agreement.

____

Full Name of Permittee

____ ____________________

Representative Signing for Permittee Date

____ ____________________

Representative Signing for DOE Date

Appendix F

Contraband Detection Test Bed

Appendix F

Contraband Detection Test Bed

F-1. INTRODUCTION

The INL is currently involved in advancing the state of the art in active interrogation, concealed weapons detection, explosives detection, vapor detection, accelerator-based technologies, munitions detection, and development of a range of next-generation detection technologies. These technologies involve nuclear smuggling detection, radioactive or "dirty" bomb assessments, chemical and biological sensors, and other sensor-based detection capabilities.

F-2. PURPOSE

The Contraband Detection Test Bed provides for evaluation and confirmation of the performance and limitations of new inspection technology/system(s) before they are actually placed in the field. The Test Bed offers both classified and unclassified testing environments for operational validation and adversarial assessment scenarios. Test Bed personnel work in collaboration with the Idaho Accelerator Center, located at Idaho State University, in Pocatello, Idaho, as well as with other test laboratories within INL. The Test Bed includes many special test facilities that evaluate methods for detecting explosives and drugs (bulk and trace amounts) in support of federal programs in these areas, and also for the detection of concealed weapons or other potential weapons of mass destruction.

INL is in the process of developing a cargo container inspection/testing facility to demonstrate individual and integrated systems for active (accelerator-based) and passive (nonaccelerator-based) inspection of transportation cargo containers. Future activities at the test facility will include independent performance testing and validation assessments of methods for maintaining security of containers, such as container tracking, new advanced seals for containers, and intrusion detection.

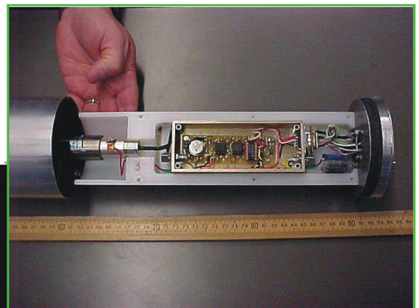
Idaho Accelerator Center

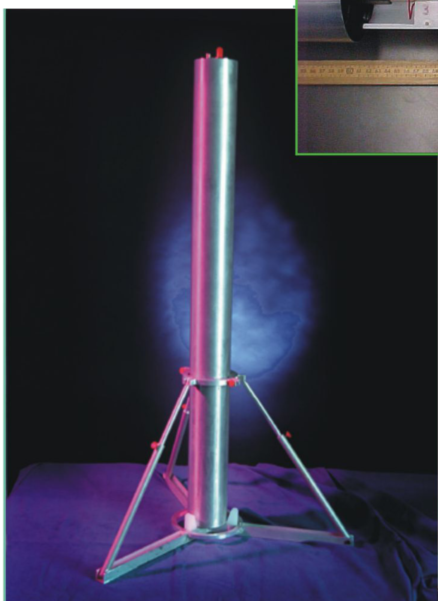
Inspection Technology Research and Development Center

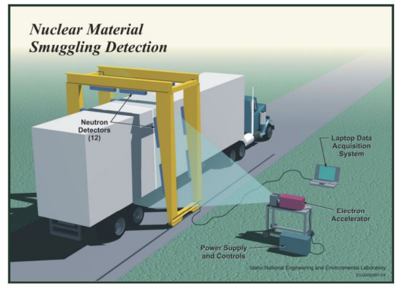
Port Cargo Inspections

This testing will provide actual and adversarial-based cargo loading configurations to allow evaluations of both active and passive technologies for the detection of most contraband materials of interest, especially concealed weapons of mass destruction.

Materials Detection Sensors







Nuclear Material Smuggling Detection System

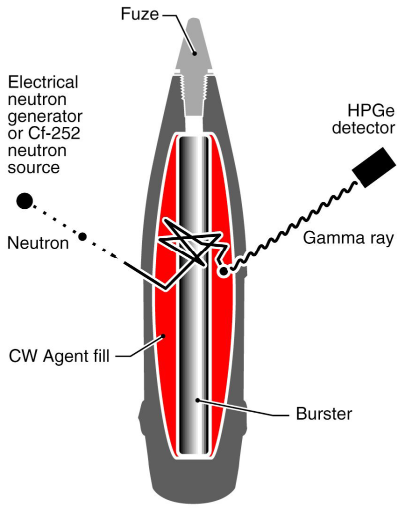
Accelerator-Based Explosive Detection System

Accelerator-Based Cargo Container Inspection System

The Contraband Test Bed allows for the testing of portable field systems for quick detection and assessment of unknown munitions, gas cylinders, and other smaller containers that may contain dangerous chemicals, explosives, or incendiary devices and other potential weapons systems. The initial PINS system, developed for the U.S. Army would also have applications to other areas of security in both the public and private sectors.

F-3. PINS Detection System

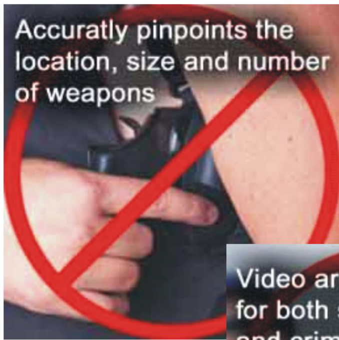
The PINS system, developed at INL, reliably identifies nerve, blister agents, explosives such as TNT and smokeless powder, military screening smokes, and compressed gasses such as acetylene, ammonia, arsine, carbon dioxide, chlorine, freon, hydrogen chloride, hydrogen fluoride, nitrogen, phosgene, phosphine, R-13 refrigerant, and silane. The testing protocols for this system and the test bed structure will enable INL researchers to create detection protocols based on previous work in which thousands of unrecovered munitions (nonstockpile) and stockpile items were identified and characterized for removal. INL is adept at developing field-portable and rugged detection systems like the PINS system, and are able to test new configurations within a host of testing environments.



F-4. Concealed Weapons Detection Systems

The Contraband Test Bed includes demonstration of magnetic induction tomography technology in weapons/contraband detection (CWD) systems as a key element in the Test Bed structure. INL has developed an array of magneto-resistive grandiometer sensors configured into walk-through weapons detection portals. The technology is enhanced by the integration of novel sensors. This Test Bed application takes on new challenges to current weapons detection systems. It addresses the limited sensitivity that enables some threats to go undetected, reduction of false alarms, and enhancement of capabilities to discriminate between actual threats and non-threats. The Test Bed enables researchers to look at detecting both ferrous and nonferrous (even nonmetallic) threats, while at the same time making major improvements in detector sensitivity and creating a fusion of technologies. In order for the current concealed weapons technologies to meet the needs of various and emerging customers, it will have to integrate active and passive detection methods. The Test Bed structure will enable the use of alternating magnetic fields as a sounding agent to reconstruct images, based on conductive and dielectric properties, that were once demonstrated in medical applications on biological samples.

The inductors and detectors can be arranged on current portal systems, increasing the spatial resolution of the system. SecureScan software will be modified for new detector technology, and new methods to enhance the sensitivity of the standard airport metal detectors will be evaluated. The test bed will also allow researchers to integrate "research grade" detectors into an INL CWD for field evaluations, integrate advanced signal processing methods to increase signal-to-noise performance, tailor algorithms developed for medical imaging for magnetic induction tomography analysis of weapon/ object localization and recognition, and develop an active magnetic induction tomography system and integrate it into a prototype CWD system.

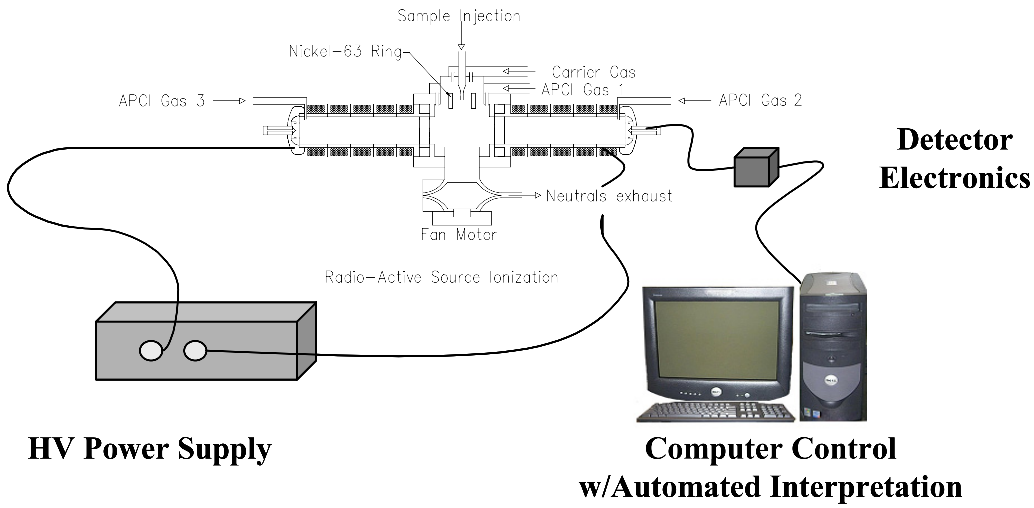


F-5. Explosives and Vapor Detection Systems

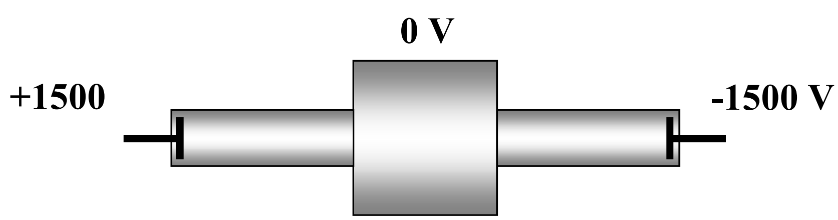
An additional element in the Contraband Detection Test Bed is the explosives detection capabilities of INL. The work has consisted of building explosive devices into radios, laptop computers, and phones as a way to determine the amount of contamination or residue that would be present under different test conditions. Various configurations and scenarios were tested to determine levels of residuals that could provide a sampling protocol for detection. As the program expanded, efforts have been under way to continue to map contamination resulting from the manufacturing and carrying of explosive devices. Work to date has been conducted for the Federal Aviation Administration, the Transportation Security Administration, and the U.S. Department of Defense. Additional work includes independent validation and verification protocols and the development of vapor generator technologies that demonstrate calibrated vapor standards to test equipment.

With the corresponding laboratory facilities located at the North Holmes Laboratory and the Idaho Research Center (in Idaho Falls, Idaho), the Test Bed will have a full complement of test capabilities for testing, chemistry, and development of prototype detection equipment to meet the needs of varying customers. The availability of various bench top instruments, vapor generators, and IMS equipment enhances the development of improved experimental equipment and methods. The Test Bed facility, located at the CITR, was specifically designed for explosives handling and research. Several prototype pieces of equipment are housed at this location, as well as magazines for explosives storage. There is an explosion-proof chamber within this facility that has explosion-proof lighting for research, development, and handling of explosives.

The dual-mode ion mobility spectrometer is in the prototype stage but is designed to detect explosives and narcotics from a single sample. Narcotics are generally detected using positive ions, while explosives are detected using negative ions; this system will allow both to be seen from a single sample. In addition, the system can be used to see the full gamut of chemical warfare agents. Biological detection, such as anthrax, has been tested on commercial ion mobility spectrometer systems. It is assumed that with some research, this system will be capable of detecting some biological agents.



Dual-mode IMS Prototype



Ionization Chamber

Vapor Generator

The Test Bed provides a fertile cache of resources for further development of instrumentation for detecting explosives. This work will enable researchers to look at new protocols associated with the detection of explosive configurations and radiological threats. Development of a dual-mode IMS that can detect both positive and negative ions simultaneously is currently ongoing.

F-6. Remote Standoff Explosives Detection System

The Contraband Detection Test Bed also includes a range of remote explosives detection technologies and testing capabilities. The need for such technologies has increased as explosive devices are developed and used by terrorist organizations as their weapon of choice. In response to this growing need, INL has developed and tested a system that will reduce the threat by using a technique called *pulsed thermal neutron analysis*, which uses high-energy neutron output to cause nuclear excitation of materials within the interior of a vehicle's cargo areas. This system uses detectors to identify elements that indicate the presence of explosives. The system can detect a minimum of 500 pounds of nitrogen-based explosives contained inside a suspect vehicle. The system was initially designed for installation at access control points, and the test bed will enable researchers to test various environments where such detection capabilities may be used. The test bed structure enabled researchers to increase detection sensitivity, eliminate detection uncertainties, modify the detection system to integrate new technological advances, develop robust products with few moving parts, and create cost effective systems. The system was designed to self-monitor, with a graphical interface for remote detection that requires little training and can be easily adapted to various environments.

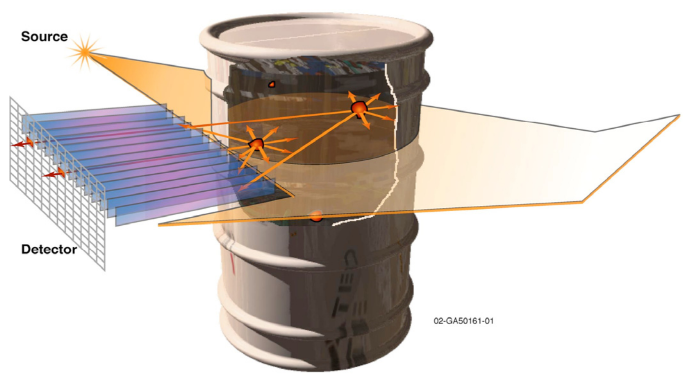
Remote Standoff Explosives Detection System (RSEDS)

RSEDS Monitoring System

F-7. Induced-Emission Imaging Detection Systems

X-ray fluorescence (XRF) is an established technique for elemental identification and characterization of materials. The INL capability is focused on expanding the traditional application areas of XRF to induced-emission imaging (IEI) of materials in containers of various sizes. Application areas include determination of heavy metals and RCRA materials in environmental and nuclear waste containers, and detection of nuclear weapons materials or shielding materials in transport containers (luggage, baggage, pallets, cargo containers). Previous work in XRF imaging has used a high-intensity monochromatic x-ray source, such as at a synchrotron facility. Such facilities provide an x-ray beam that works well on very small, low-density objects. The capability here is in combining XRF with the methods of 2-D and 3-D x-ray tomography using more portable, higher-energy, broadband x-ray sources, avoiding the requirement for a synchrotron x-ray source and allowing access to larger packages. Concepts for XRF imaging include the use of Bremstrahlung (broadband) x-ray sources, including linear accelerators and x-ray generators, XRF tomographic imaging of high-density materials, and combined conventional transmission x-ray imaging with region-of-interest XRF. Bremstrahlung sources (linear accelerators and generators) produce very-high-energy x-ray beams (6 MeV and 300 kVp, respectively, for this work) allowing for deep penetration of the excitation radiation in dense or thick objects. Applying tomographic principles in XRF imaging allows for material identification, spatial location, and shape of materials embedded in packages. Region-of-interest XRF based on high-speed x-ray transmission allows for very rapid inspection of containers.

- Spectral data from high-energy excitations—including production of nuclear isomers, positron emission, and photonuclear events—can be used to improve the characterization of suspect packages.
- Information on spatially dependent heavy metal and transuranic elements in heterogeneous, debris-type containerized waste or suspect packages can be obtained by directing x-ray fluorescence measurements at suspect regions of interest found through x-ray transmission imaging.
- A combination of digital radiography and computed tomography, collimated XRF, and gamma spectrometry more rapidly characterizes containers.

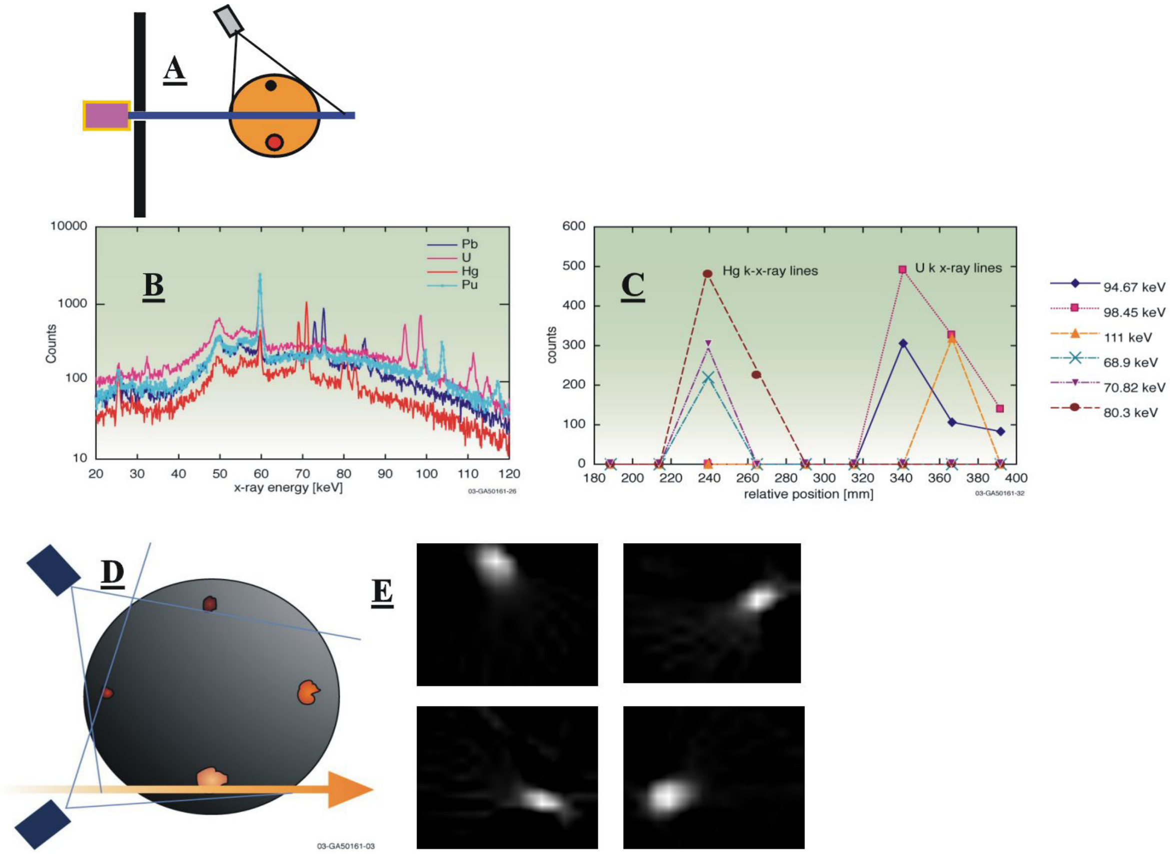


Background: X-ray fluorescence (XRF) occurs when an incoming x-ray photon causes the ejection of a bound electron from an element. Subsequently, a free electron (or an electron in an outer shell) drops into the vacancy established by the interaction, and an x-ray photon that is characteristic of the transition (and hence the element) is emitted. This phenomenon occurs in all elements. The energy of the characteristic photon increases with the Z-number of the element. For our investigation, we are interested in those elements that are higher Z and hence produce higher energy photons. This group includes mercury, lead, uranium, and plutonium, elements that are of particular interest for environmental concerns and for national defense (homeland security) concerns.

Two capabilities have been established. The first uses a high-energy (6-MeV) linear accelerator and a 300-kVp x-ray generator. The second uses the lower-energy (300-kVp) x-ray generator located in INL's Digital Radiography and Computed Tomography (DRCT) Laboratory at Idaho State University (ISU) for both XRF imaging and combined transmission x-ray region of interest XRF.

High-energy XRF Imaging: This capability uses a highly collimated 6-MeV pulsed linear accelerator to induce XRF in samples. Test results with uranium and mercury (in 25-mm-diameter cylinders) in a 16-cm-diameter sand-filled can are shown in Figure F-1A. The can was translated through the beam in a direction normal to the beam direction. At each step, spectra were collected (Figure F-1B) with a high-purity germanium (HPGe) detector. Due to collimation in this geometry, the detectors are not sensitive to the direct excitation Bremsstrahlung beam, but are sensitive to photons that have Compton-scattered from the object or fluorescence photons generated by x-ray interactions in the high-density materials. Figure F-1C shows a clear spatial response for both K_α and K_β lines of mercury and uranium. These results demonstrate the potential of linear accelerators in induced-emission imaging.

XRF Imaging with a 300-kVp x-ray generator: A separate setup demonstrates the feasibility of high-energy XRF imaging with a continuous 300-kVp x-ray generator. A 16-cm-diameter sand-filled can containing four vials of high-density material was used as a test object. The density of the sand was about 1.5 gm/cm^3. The diameter of the vials ranged from 2.5 to 3.75 cm. Each contained only one element: lead, uranium oxide, mercuric chloride, or plutonium. The first three items were in powder form; the plutonium was in the form of two flat disks: each Pu disk was 1g and was embedded in a low-density resin. The x-ray generator was collimated to a ~2.5-cm pencil beam for irradiation of the sample. The four elements were spatially separated so that in certain orientations the excitation beam would only probe one element. The experimental setup is shown in Figure F-1D for beam collimation, but data acquisition includes both translation and rotation of the object in a typical tomographic scan. In Figure F-1D, the large circular shell represents the can and defines the edge of the object space. The four smaller objects represent the high-density materials within the can. The red horizontal line represents the pencil beam of x-rays. Two thin germanium detectors with beryllium entrance windows were used as x-ray detectors. Figure F-1E shows the tomographic reconstruction of the four individual elements.



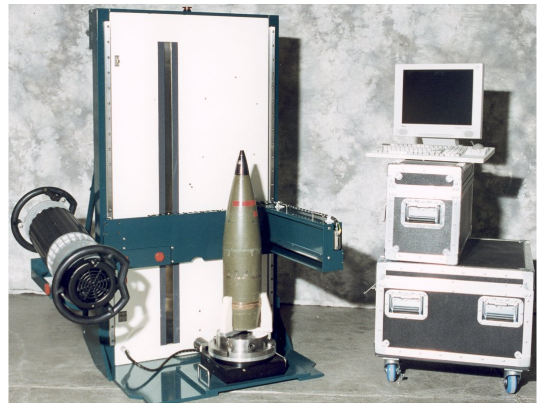
A. A high-energy x-ray source is placed behind a thick wall to support collimation of the x-ray beam and reduction of undesirable scattered radiation. **B.** Typical x-ray fluorescence spectra from several elements. **C.** Results of a linear translation scan of the x-ray beam across the object. The mercury and uranium lines separate spatially, indicating their placement in the can. **D.** Setup for first tomographic scan. **E**. Four tomographic reconstructions, one for each element placed in the can of sand.

Figure F-1. Initial XRF imaging tests.

An object was constructed consisting of a small cup with holes bored in the bottom to accommodate small vials of high-density materials (Figure 2A). This object was loaded with several materials (tantalum, mercuric chloride, lead, and uranium oxide) in separate vials and then filled with water to serve as an attenuating matrix. A complete 2-D tomographic scan was acquired by translating the object in 28 steps of 3 mm each and rotating 60 times at 6 degrees per rotation (Figure 2C). Spectrum acquisition time for each data point was 15 seconds. With motion overhead, the data collection required 11 hours. The resulting 2-D tomographic slice image of the four materials in the cup is shown in Figure 2C.

Combined Transmission X-ray Imaging and XRF Region of Interest Inspection: A likely scenario for the deployment of XRF inspection for either environmental applications or weapons of mass destruction (WMD) is to combine conventional x-ray transmission imaging with XRF. In many situations, transmission x-ray imaging is already an accepted method of inspection. Adding XRF to verify the presence of specific materials when suspicious images are encountered may greatly improve the statistics for true positives and reduce false alarm rates.

F-8. DRCT Detection Systems



INL has developed and implemented field-portable, high-resolution digital radiography and computed tomography (DRCT) systems for nonintrusive inspection of munitions and munitions containers. These x-ray systems are used to determine type, number, and configuration of munitions in containers, status of the fuzing and firing train, physical integrity of individual munitions and their containers, and liquid levels when present. This information is used to make decisions on safe handling and storage of munitions and to aid in content identification. The scanning systems may also be used for a variety of other imaging tasks, including packages and containers.

The DRCT systems incorporate vertically scanning x-ray sources, linear detector arrays, and object-rotational staging. For field scanning of single munitions within containers, a transport dolly serves as the mounting stand for the modular imaging assembly.

The DRCT system basically consists of:

- Imaging systems with
  - Real-time radiography
  - DR with scanning 1-d linear arrays
  - DR with 2-D area arrays
  - 2-D multiple slice CT
  - 3-D Spiral CT
  - 3-D Cone Beam CT
  - Isotopic CT and Densitometry
- Energy range from 30 kVp to 2 MeV
- Large range of object size and image resolution:
  - Objects from 1mm to 1m diameter, 1m height
  - 50–100 micron resolution for objects up to 2 cm
  - 0.5–2.0 mm resolution for larger objects
- 12- to 18-bit dynamic range
- INL-developed image acquisition, processing, and display software.

Radiographs are obtained by simultaneous vertical motion of source and detector. Tomographic data are obtained by simultaneous vertical translation of source and detector with object rotation. Objects up to 40 inches high and 12 inchs diameter may be imaged. The x-ray tube head, detector, and rotational stage are removed and placed in cases for transport. The system has been transported in station wagons, minivans, trailers, and motor homes—it is truly field-portable.

For scanning objects too big for the smaller system shown above, larger scanning systems have been developed. The scanning system shown below can fully image an 85-gallon drum. It resides on 8-inch wheels and can be easily moved within a facility or placed in a trailer for transportation to remote locations. This system uses a 450-kV x-ray generation system and 1024-element high-resolution linear detector array.

All system functions on our scanners can be controlled remotely up to 300 feet. On the portable singles scanner, a conventional digital x-ray of a munition or over-pack, up to 12 inches in diameter and 40 inches long, can be produced in less than two minutes. A two-dimensional tomographic slice at any height on the munition can be produced in less than one minute, while full 3-D images can be generated in about 10 minutes. Likewise, scanning an 85-gallon drum on the larger scanner can be achieved in 5 minutes or less. The INL DRCT image processing and display software allows the operator to review, process, interpret, and distribute images immediately following acquisition.

This system produces high quality radiographs that show internal components within the munition, drum, or other container being scanned, providing information on the contents (liquid, solid, or other) and other attributes of the object(s) residing within the container.

F-9. TEST BED LOCATION

This test bed consists of multiple sites at the CITRC and at the INL Research Center, North Holmes Complex, Idaho Innovation Center, Idaho Accelerator Center, and Pocatello Airport Test Complex.

F-10. CONTRABAND TEST BED ORGANIZATION

Active Interrogation PI
Dr. James L. Jones
208-526-1730
James.Jones@inl.gov

Concealed Weapons Detection PI
Dale Kotter
208-526-1954
Dale.Kotter@inl.gov

PINS Detection System PI
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Gus.Caffrey@inl.gov

Remote Standoff Explosives Detection PI
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208-526-0994
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Explosives & Vapor Detection PI
Carla J. Miller
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Carla.Miller@inl.gov

IEI and DRCT PI
Tim J. Roney
208-526-9712
Timothy.Roney@inl.gov

F-11. TEST BED PROCESSES AND SCHEDULING

This Test Bed facility is scheduled through the CITRC office Test Range director, who can be reached at 208-526-0314. Principal investigators assigned to specific projects will coordinate unique scheduling requirements based on the nature of the project.

F-12. TEST BED SECURITY

Security for the test bed is in accordance with the security section of the *Critical Infrastructure Test Range Users Manual*. Currently, there are no unique security requirements for this Test Bed; however, the nature of the project may dictate more rigorous or stringent security requirements.

F-13. INFORMATION AND REPORTING

Information and reporting protocols will be directed by client-based requirements.

Appendix G

Unmanned Aerial Vehicles Test Bed

Appendix G

Unmanned Aerial Vehicles Test Bed

G-.1 INTRODUCTION

INL has an applications research and development center focused on small, autonomous unmanned aerial vehicles (UAV). The program includes small, fixed wing and rotary wing air platforms used for mission development and for conducting experiments in multi-agent and heterogeneous UAV behaviors. Platforms are used for various applications experiments, including military, environmental, security, communications, and others. INL has established itself as a UAV provider of scientific and advanced services for the Defense Advanced Research Projects Agency, Army Applied Aviation Technology Directorate, NASA, and other private aerospace organizations. INL is a leader in multi-agency operations, with simultaneous flight of five, concurrent, autonomous UAVs from a common ground station.

G-2. PURPOSE

Many missions previously performed by manned systems or large, expensive unmanned systems can now be performed by small, inexpensive UAVs with state-of-the-art structures and controls. Applications relevant to the Department of Energy include surveillance of critical infrastructures (e.g., power transmission and distribution, oil and gas pipelines), general security surveillances (INL is piloting such an application), and remote system interrogation of any infrastructure. Construction is complete on the INL small-UAV runway. The facility includes a paved surface, 1000 × 100 ft., dedicated as a support site to enhance the capabilities of the program. This airfield allows onsite flight-testing and demonstration and offers a unique advantage in mission development and training. With completion of the airfield, we can provide a mature UAV platform with an integrated airborne sampler/sensor for immediate deployment. The airfield will also be used for security-related area and perimeter surveillance, allowing missions to be flown routinely. This will provide broader site coverage and increased probability of early detection of unauthorized intrusion, thus allowing more timely and effective response. In addition, an established UAV program/airfield can reduce the need for more expensive, permanently located, manned aircraft (e.g., helicopters).

Ongoing INL initiatives, based on current customer needs, include:

- Advanced UAV communications research and development targeted at increasing, enhancing, or solving non-line-of-site UAV communications issues.
- Advanced research in a variety of related UAV and associated payloads, such as permanent and dedicated (e.g., aerial imagery sensors or communication packages).
- Advanced Autonomy and multi-agent behavior research and development looking at methods of increasing mission success and overall effectiveness.

The UAV airfield will allow onsite flight-testing and demonstration currently conducted at remote or out-of-state military airfields for larger UAV assets. With its access-controlled boundary and FAA-Certificate of Authorization, the INL is in a unique situation to offer UAV and unmanned ground vehicle collaborative operational testing and demonstration.

INL has planned additional work to develop a higher degree of autonomy, communications, and vehicle intelligence while flying specific missions.

G-3. TEST BED LOCATION

The UAV Airfield is located at the INL CITR, north of Central Facilities Area**.** The Operations Area is described by the coordinates below (NAD83/WGS84). Vertical confines of most operation are less than 6000 ft MSL, 1000 ft AGL. Base altitude is about 5,900 ft MSL.

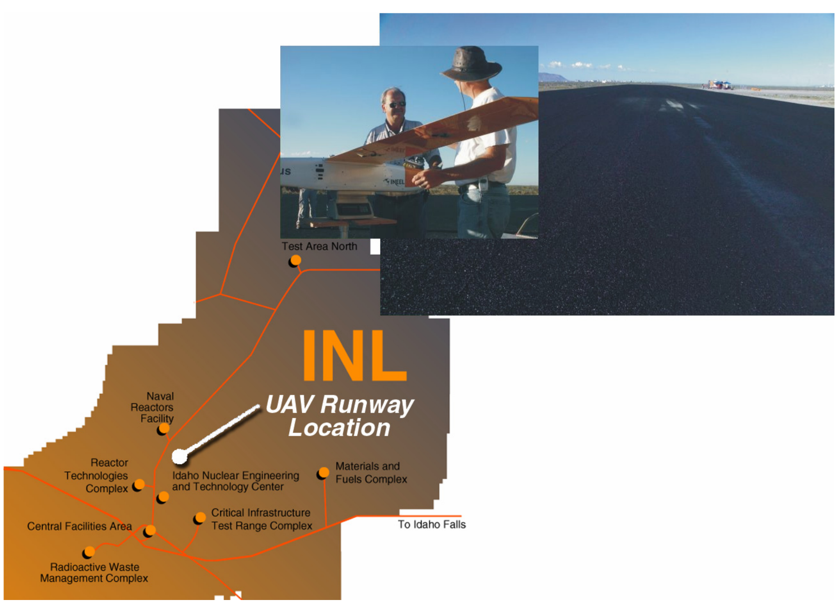
(1) 43º37’37” –112º54’77”

(2) 43º37’37” –112º 52’13”

(3) 43º35’73” –112º 52’13”

(4) 43º35’73” –112º 54’77”

Operations beyond the flight boundary, horizontal or vertical, will be considered on a mission-by-mission basis. In some cases, coordination will be required.



G-4. UAV TEST BED ORGANIZATION

PI, Scott Bauer
(208) 526-8967
(208) 521-5243
Scott.Bauer@inl.gov

G-5. TEST BED PROCESSES AND SCHEDULING

Scheduling will be coordinated as required and tailored to client needs.

G-6. TEST BED SECURITY

Security for the center will be in accordance with the security section of the *Critical Infrastructure Test Range Users Manual*.

G-7. TEST BED SAFETY

UAV testing at INL will require verification and validation of onboard safety systems. These systems will require a flight checklist and testing before deployment. Flight operations include positive visual sight of the UAV at all times and include the ground operator's ability to terminate flight at any time during operation. Telemetry systems must be positive at all times to monitor system performance, verify/ensure communications, and navigation. Onboard, autonomous features include logic to terminate flight automatically in the case of lost communications or navigation. INL personnel will work with developers to ensure success of research and safety of flight.

G-8. INFORMATION AND REPORTING

Information and reporting will be coordinated as required and tailored to meet client needs.

Appendix H

Incident Response Technology and Training Test Bed


Appendix H

Incident Response Technology and Training Test Bed

H-1. INTRODUCTION

INL has teamed with the Special Programs Division, West Desert Test Center, Dugway Proving Ground, Utah, to offer training expertise and optimal training environments to military units, regional law enforcement, and National Guard Weapons of Mass Destruction Civil Support Teams. West Desert Test Center (WDTC) specializes in realistic, challenging training for threats from chemical and biological weapons of mass destruction. INL has been in the nuclear/radiological science business for over five decades, safely designing, constructing, and operating over 50 mostly first-of-their-kind nuclear reactors on its desert test range. INL has collaborated with WDTC to add complementary radiological training to the WDTC's repertoire of chemical and biological weapons training.

Currently, military units specializing in weapons of mass destruction (WMD) response are taking advantage of the INL's vast experience and skilled radiological SMEs to provide training very similar to DOE Radiation Worker Level I and partially Level II. Military teams visiting INL are already "certified" in this field in order to field their teams, but require a minimum number of hours in sustainment and refresher training in the chemical, biological, and radiological fields. It is our goal to ensure that these teams are trained to identify radiological hazards and identify and mitigate the situation until follow-on agencies arrive on the scene. We accomplish this through comprehensive classroom training, hands-on practical exercises, and realistic, scenario-based field training exercises (situational exercises).

H-2. PURPOSE

Our Nation's vulnerabilities and communications problems were painfully recognized on 9/11. Realistic training can make the difference between a knowledgeable response by, or increased risk to, military or other first-responder organizations. The vision of this program is to be recognized as the leading national laboratory for developing new technologies and providing the radiological training necessary for our Nation's emergency response organizations to successfully conduct their mission.

INL has been very successful in meeting the technology needs of the U.S. Army Technical Escort Units. Other emergency response organizations, such as the National Guard WMD Civil Support Teams, require similar technologies. Technology needs for first-response agencies include WMD material assessment/identification equipment, for which INL has developed a multitude of technological solutions, such as:

- Portable isotopic neutron spectrometry (PINS) system
- Field portable digital radiography and computed tomography (DRCT)
- Secondary ion mass spectroscopy (SIMS) system
- Raman spectroscopy
- Gamma-neutron Pager
- Hazmat Cam (remote wireless video system capable of operating in contaminated areas and completely submersible for wet decontamination)
- Mobile command posts.

Customers using this radiological training program are able to practice their response skills and interactions with a variety of other emergency response organizations, including state and local law enforcement, fire department hazardous material units, Bureau of Homeland Security, Center for Disease Control, Department of Environmental Quality, FBI, etc. Field training exercises also allow for invaluable testing of the customer's standard operating procedures.

H-3. TEST BED LOCATION

The test bed is CITRC Building PER-609 and surrounding areas. Field exercises may use town facilities as well, depending on the scenario being delivered and the customer's specific requests.

Technology requests will be handled at a leased laboratory located at 2556 Heyrend Way, Idaho Falls, Idaho 83402.

A mobile training team is also available to deliver radiological classroom training, hands-on practical exercises, and scenario-based field exercises at the customer's home location. We are able to ship our radiological sources and provide the same quality training in a convenient location familiar to the customer. Pricing for this type of training will reflect travel and per diem costs.

H-4. Incident Response Technology and Training Organization

Technology Principal Investigator, Kevin Young
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208-520-1628 cell
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Training Principal Investigator, Yvette Leppert
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208-521-0309 cell
Yvette.Leppert@inl.gov

H-5. TEST BED PROCESSES AND SCHEDULING

Contact the appropriate principal investigator (lead) by e-mail or telephone and state your interest to do business with INL. If possible, this should take place at least 60 to 90 days (depending on scope) before the suggested date of training, testing, or technology request. Based on scope and objectives, an informal cost estimate will be generated and returned for review. As a government agency, INL is able to accept money through the Military Interdepartmental Purchase Request (MIPR) system. Once the cost has been approved and a MIPR is received at INL, work can begin.

Success of this program, and its predecessors, has been due to working very closely with the end user of the technology and/or training. This interaction is accomplished by e-mail or telephone communications and will continue until the service or product is delivered.

H-6. TEST BED SECURITY

If you have a valid DOE photo badge, you will be granted unescorted access to nonsecure town facilities. Your principal investigator will provide information on secure facilities before your arrival.

Those clients not possessing a DOE badge will be issued a temporary visitor's badge. The escort requirements will depend on security clearances, or lack thereof. Clients that have current security clearances (common to most military customers) can send their clearance information directly to DOE before their visit, and visitor badges will be issued accordingly. Clients not possessing a security clearance will be under escorted access while at INL (unless otherwise noted by specific facilities).

Escort requirements are also directly related to the Department of Homeland Security Threat Advisory Levels. These levels will be communicated by INL security personnel either before or upon your arrival at the CITRC.

H-7. INFORMATION AND REPORTING

Information and reporting for technology development will be in the form of in-process reviews and periodic reports. The frequency of these reports will be at the discretion of the client.

Information regarding radiological training will be in the form of an agenda, with direct correlation to the objectives stated by the client. At the conclusion of field exercises, an after-action review will be conducted, requiring joint input from INL and the customer. Upon request, INL will generate an after-action review report.

Appendix I

Electrical Power Grid Test Bed

Appendix I

Electrical Power Grid Test Bed

I-1. INTRODUCTION

The Department of Energy's (DOE's) Office of Electricity and Energy Assurance (OE) is helping to develop technology solutions for national electrical grid reliability. OE is addressing near-term prevention detection and response, and is "expanding the set of transmission and distribution technologies" to modernize the nation's "electric grid for the 21st century." To help address this goal, the INL is offering its electrical power grid and associated infrastructure to support technology testing and evaluation at full-scale and under real-world conditions.

INL Electric Power Grid

The INL designed, built, and operates its own 50-MW electrical power transmission and distribution system 24 hours per day, seven days per week. The system, located within INL's 890-square-mile site, consists of a 57-mile, 138-kV transmission loop, with several substations and multiple feeder lines. The grid is also linked with state-of-the-art supervisory control and data acquisition (SCADA), communications, and cyber security testing capabilities.[a] The power grid is operated under a full range of climatic conditions (temperature, wind, snow, ice, etc). INL can safely isolate sections of the electrical power grid and associated testing infrastructure to conduct full-scale testing of various technology components, systems, and processes.

Testing at INL

The INL has supported an applied energy, engineering, and testing mission for more than 50 years. The laboratory has developed testing facilities and a rich testing culture where classified, unclassified, and commercially sensitive testing and evaluation can occur safely and securely. INL has the capability to test and evaluate transmission systems over great distances, with the ability to transfer significant amounts of low-cost power for testing.[b] The INL can conduct various types of full-scale power system component and reliability tests,[c] including:

- Transmission and distribution materials, components, and control systems
- Advanced information, monitoring, communications, and controls technologies
- Control room operational processes and human factor optimization
- Applied distributed generation systems (both controls and interconnections)
- Power system monitoring and visualization
- SCADA system/components testing and evaluation
- Cyber and infrastructure testing and evaluation
- Operational impact testing.

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[a] Part of several energy-related test beds making up the INL Critical Infrastructure Test Range.

[b] Power cost explanation: INL costs are in the range of $0.031/kWh plus $5.10/kW peak demand charge.

[c] The availability of testing sites depends on the isolation of certain segments and coordination with other usages at the site.

The DOE has made very sizable investments in INL energy infrastructure[d] that can be leveraged with current and future OE efforts. The INL electrical power grid and supporting infrastructure can strengthen and extend existing OE testing capabilities[e] by providing full-scale facilities, which operate under real-world conditions. The INL has a reputation for being safe, responsive, and providing practical solutions. INL has an extensive history of cultivating strong industry relationships crucial to transferring innovative technologies and has successfully teamed with both industry and other national laboratories.

I-2. INL ELECTRICAL POWER GRID CHARACTERISTICS

The INL has the assets needed to provide full-scale testing and demonstration of experimental and prototype electrical power system transmission and distribution technologies under real conditions. The system includes the following assets and characteristics:

- Fifty MW electrical power transmission and distribution system
- Fifty-seven miles of 138-kV transmission redundant looping grid (strong reliability)
- Eight major substations
- Contained within a 890-square-mile secure and isolated site
- Site connection to two utility substations
- INL site facilities connected to three different utility systems: Idaho Power, Utah Power and Light, and Montana Power; town facilities connect to Idaho Falls Power
- Twenty-one major substation transformers, ranging in size from 2.87 to 33.3 MVA
- Sixty-plus distribution feeder circuits, ranging in voltage from 2.4 to 13.8 kV
- Extensive system, with thousands of transformers, breakers, switchgear, capacitor banks, motor control centers, and other power system components
- Distribution circuits/feeders with both underground and overhead lines and cables
- Lightly loaded or unused distribution circuits available for testing
- Transmission lines longer than 10 miles available for line tests
- Twenty-four/seven test operations and monitoring support available
- Backup generation available in many areas
- Generator interconnections available for interconnection IV&V
- Site load typically ranging between 15 and 30 MVA
- Full suite of communication options available at the site (and many of the substations) for various testing scenarios: fiber optic, copper, microwave, cellular, and many different protocols and connections, including Ethernet, modems, Modbus, DNP 3.0, etc.
- Complete integrated SCADA controls for much of the power system, which utilizes PLCs, RTUs, HMI, latest technology in relays, power meters, and other controls, monitoring, and communication
- Advanced control room evaluation centers
- Extensive testing and analysis equipment

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[d] Represents over $100M to date.

[e] Such as found at the National Transmission Technology Research Center and the National Renewable Energy Laboratory.

- The INL has extreme weather conditions for representative testing
- Testing capabilities at low, medium, and 138-kV voltage levels
- Communication testing (ambient, proprietary testing)
- Component testing capabilities for ultra-capacitors, batteries, and other storage and electrical devices
- Engineering support for full-scale testing and demonstration, including training and assessment of new technologies and their operational impact.

I-3. INL ELECTRICAL POWER GRID TESTING CAPABILITIES

The INL is an applied energy, engineering, and testing laboratory that has extensive experience in power/electrical system design, simulation, testing and operation of transmission (138 KV) and distribution (2.4 to 13.8 KV) systems. The INL is equipped to test and evaluate various energy processes and technologies, such as the following:

Testing of Advanced Conductors and Tower Design:

- Design and installation of parallel transmission line test circuit(s) to part of existing INL system to transfer large amounts of power through the test system with fast-acting, make-before-break transfer/failover to the existing circuit if test system fails. This supports a variety of test scenarios for advanced composite conductors or superconductors, etc.
- Lightly loaded or unused distribution circuits available for numerous types of tests.
- Vast area and long distances (greater than 10 miles if desired) available for testing/test systems.
- Capability to support comprehensive power line conductor testing. Capabilities include a system with fully controlled current supply to the conductor(s), with measurement devices for current, voltage, temperature, tension, sag, atmospheric conditions, etc.
- On site, fully capable line crew available to support construction of advanced tower designs for testing.

Testing of Modeling and System Planning Tools:

- Capability for power flow studies, fault/short circuit analysis, protective device coordination, harmonic analysis, stability analysis, transient and other electrical analysis, and other related power/electrical system studies.
- Power system operational experience and extensive computer hardware and programming/software resources available on site.
- Reliability modeling and assessment of critical infrastructure systems.

Testing of Monitoring Technologies (frequency, voltages, VARs, phasors, line sag):

- Wide Area Measurement systems and controls and Phasor Measurement Unit (PMU) tests. Power system substations and communication systems to support IV&V and R&D activities. For example, PMUs could be placed at site substations and Idaho Falls facilities with as much as 50-mile distances between some components.
- Time stamps, system response and control, and other items using various communication topologies and systems (i.e., fiber optic between some components, copper between others, and communication routing to introduce differing time delays into the test system).

- Time stamp and other SCADA R&D elements for testing and validation at the INL SCADA and Power Grid Test Bed.
- Unusual loading conditions, transients, and other scenarios applied to the power system for FACTS-type component/system testing or other new power control technology testing.
- Power flow control, line sag, transient stability, and many other scenarios on the INL power system over reasonably large distances with the 57-mile transmission loop and substation dispersal.
- Adequate area to support new and developing high-voltage power line research work.

Testing of Data Acquisition Technologies:

- Testing and evaluation of technologies that contributed to blackouts and are under product improvement cycles.
- Development and implementation of new sensor technologies for voltage, current, and physical security.

Testing of Visualization Tools:

- Staff with software and applied engineering skills with operations experience, available for development and validation of new visualization tools.
- Summary of INL power system status and health information available and on-line for developing and validating new visualization systems.

Testing of Communications Systems (prevention and detection):

- Energy communications (Communications/Cyber/SCADA Test Beds).
- Wireless communication test bed high capacity loop FO telecom/Data system.
- Emergency preparedness, response, and recovery (procedures, processes).
- Control room operations (human factors engineering).
- Improved system information for better control and real system functionality.

Testing of Distributed Generation:

- Expertise in all sizes of distributed generation systems.
- Capability to evaluate and validate all forms of interconnection systems.
- Capability to perform large-scale, hybrid-generation storage systems testing and validation.

Testing of Energy Storage Systems:

- Advanced and hybrid energy storage testing.
- Regional integration of energy storage and electronic systems.
- Component testing capabilities for ultra-capacitors, batteries, and other storage and electrical devices.

I-4. TEST BED LOCATION

The INL CITR Site transmission loop and distribution lines, substations, and SCADA Operations Center, CFA-681.

I-5. ORGANIZATION

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I-6. TEST BED PROCESSES AND SCHEDULING

Process/procedures developed to date; scheduling will follow standard CITRC protocols.

I-7. TEST BED SECURITY

Security for the center will be in accordance with the security section of the Critical Infrastructure Test Range Users Manual. Currently, there are no unique or exceptional security requirements for testing.

I-8. INFORMATION AND REPORTING

Testing reports will be generated at the request of the customer.

Appendix J

Physical Security Test Bed

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Physical Security Test Bed

J-1. Introduction

INL has several existing laboratory facilities that will be used to develop and bench test physical security systems and sensors for the energy infrastructure (e.g. hydro, electric, natural gas, oil, petroleum, refineries, port facilities, and storage facilities), and for border/seaport security. The sensors and systems will derive from the private sector, academia, other national laboratories, and within INL. After laboratory development and testing is complete, the physical security systems and sensors will be tested at the Physical Security Test Bed, i.e., the CITR, as appropriate. The infrastructure will include both vacant and occupied buildings, integrated facilities, operational areas, and the INL perimeter. INL Safeguards and Security staff will challenge the physical security systems and sensors. The uniqueness of this test bed is its ability to integrate with the INL CITR, which includes controls, communications, and facilities, to challenge security systems as integrated components of these assets in real time.

J-2. TEST BED LOCATION

Testing for Physical Security could take place at a number of test bed facilities on the INL CITR.

J-3. ORGANIZATION

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